Telephony.

THE AMERICAN TELEPHONE JOURNAL

Comprising Telephony, American Telephone Journal, Sound Waves, Telephone Magazine, and The Telephone

PUBLISHED WEEKLY BY THE TELEPHONY PUBLISHING COMPANY. MONADNOCK BLOCK. CHICAGO

VOL.. XVI. No. 6

CHICAGO, SEPTEMBER 19, 1908

10 CENTS PER COPY
$2 PER YEAR TO U. S., CANADA AND MEXICO
$3 PER YEAR TO OTHER COUNTRIES

COPYRIGHT 1908. ALL RIGHTS RESERVED

1889 Paris Exposition Medal for Rubber Insulation 1893 World's Fair Medal for Rubber Insulation

OKONITE TRADE MARK REG U.S. PAT. OFFICE

THE STANDARD FOR RUBBER INSULATION

OKONITE WIRES, OKONITE TAPE, MANSON TAPE, CANDEE PAT'D POTHEADS

THE OKONITE CO., Ltd. Sole Manufacturers 253 Broadway, New York

WILLARD L. CANDEE, H. DURANT CHEEVER, MANAGERS. W. H. HODGINS, SECRETARY. GEO. S. MANSON, SUPERINTENDENT. W. C. CANDEE, ASST. SECRETARY

OKONITE TRADE MARK REG U.S. PAT. OFFICE

CONDUIT

P C C

CLAY PRODUCT COMPANY

Stock Exchange Bldg. CHICAGO

CHAS. G. STEVENS CO.

BRIGHT COLD ROLLED AND COLD DRAWN

NORWAY IRON, MAGNET STEEL

Cold Drawn Steel—Rounds, Flats, Square, Hexagons.

COLD ROLLED STRIP STEEL

LARGE STOCK ALWAYS ON HAND.

58-60 South Canal Street, CHICAGO

McROY CONDUITS

CHICAGO

ROOKERY BUILDING

KERITE

Insulated Wires and Cables

DAYS KERITE 1850 1908

The Insulation which has withstood successfully the test of half a century

W. R. BRIXEY, Sole Manufacturer

HUDSON TERMINAL

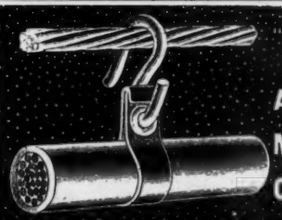
30 Church Street, NEW YORK

CHICAGO TELEPHONES SATISFY

CHICAGO TELEPHONE SUPPLY CO.

FACTORY AND GENERAL OFFICES

ELKHART, IND. U.S.A.



"I-LET All Metal Cable Hanger

Costs no more than Marline, is infinitely superior. Write for sample.

Save cressarms by using our "Standard" Aerial Rings for supporting aerial cables or insulated service wires. Our rings will not slip when cable is being installed.

Durable and Cheap

Yonkers Specialty Co.

YONKERS, N. Y.

"DETROIT" RUBBER COVERED WIRES

Telephone Pair a Specialty

DETROIT INSULATED WIRE CO.

Detroit, Mich.

PLATINUM

Wire, Sheet, Rivets and Contacts

Send for Literature

BAKER & CO., Inc., Newark, N.J.

N. Y. Office: 30 Church Street

TELEPHONE CABLE

WATERBURY CO., 69 SOUTH STREET, NEW YORK CITY

ALPHABETICAL INDEX TO ADVERTISEMENTS ON PAGE 20

Peirce Specialty Company

ELKHART, INDIANA

Engineers, Designers and Manufacturers

Peirce Specialties

All Steel Pole Brackets, All Steel House Brackets, All Steel Transposition Brackets, Pole Seats (5 Designs), Cross Arm Back Braces (Channel Steel), Distributing Circles (3 Design), Fastenings for twisted pairs, Expansion Bolts, Hammer Drills for Drilling Masonry, Test Connectors and Cable Hangers.

The Indiana Rubber & Insulated Wire Co.

MANUFACTURERS OF

PARANITE TRADE MARK

Insulated Wires and Cables

JONESBORO, IND.

We Make Toll Tickets by the Million

By means of new facilities just acquired, and thus produce them better and cheaper than can be done in small lots. We can furnish them promptly in any quantity, on better paper, put up in better shape, and at LOWER PRICES THAN EVER BEFORE OFFERED.

WE ALSO FURNISH

Lease Records	Directories
Toll Journals	Trouble Tickets
Toll Ledgers	Rental and Toll Bills
Monthly Check Reports	Voucher Checks
Cash Books	Card Index Systems

Steel Telephone Signs

All kinds of Blanks, Forms and Books for Telephone and Toll Line Accounting.

Write for Sample Forms and Prices.

THE TELEPHONE PRINTING COMPANY

DEFIANCE, OHIO

HOW TO USE THE WILLIAMS TEST CLAMP

Hold clamp between thumb and first finger, then press together, causing the jaws to open wide. Insert the wire you are to test in the valley or groove and release the pressure, allowing the needle points to come down on the insulation with a clean bite. Then with the thumb on the stud or screwcap press the jaws together firmly. This will force the needles through the insulation, making a good contact with the conductor, which contact the spring steel jaws will hold steadily while the test is made. Send 75c. for a set (2) postpaid. Your money back if you want it.

The Williams Test Clamp Co.

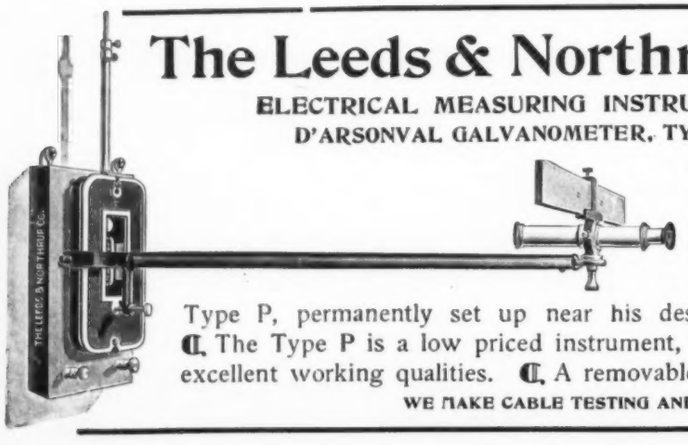
720 Electric Bldg. Cleveland, O.

Monnot Copper-Clad Steel Wire

Smoke and gas from locomotives and factories
A small wire of Copper-Clad will not stretch like copper or corrode like galvanized

Manufactured by

DUPLEX METALS CO. - 208 Fifth Ave., New York



The Leeds & Northrup Co., 4901 Stenton Avenue PHILADELPHIA

Monadnock Block CHICAGO

ELECTRICAL MEASURING INSTRUMENTS

D'ARSONVAL GALVANOMETER, TYPE P

¶ Your wire chief has use for a reflecting type D'Arsonval Galvanometer. His cable testing set will have a greater range if he can make insulation and capacity measurements with a reflecting galvanometer. With our Type P, permanently set up near his desk, he can make routine tests of insulation. ¶ The Type P is a low priced instrument, well made, of pleasing appearance, and has excellent working qualities. ¶ A removable damper converts it for ballistic measurements.

WE MAKE CABLE TESTING AND FAULT LOCATING APPARATUS

Construction Material

GALVANIZED Telephone and Telegraph Wires, Cross Arms and Braces, Pins, Brackets, Insulators, Pole-Steps, Lag Screws, Clips, Machine Bolts, Carriage Bolts, Shims, Messenger Clamps, Lightning Arresters, Guy Anchors, Ground Rods.

Our Stock of Construction Material and Appliances is Complete and Adequate in Every Way. Send Us Your Orders.

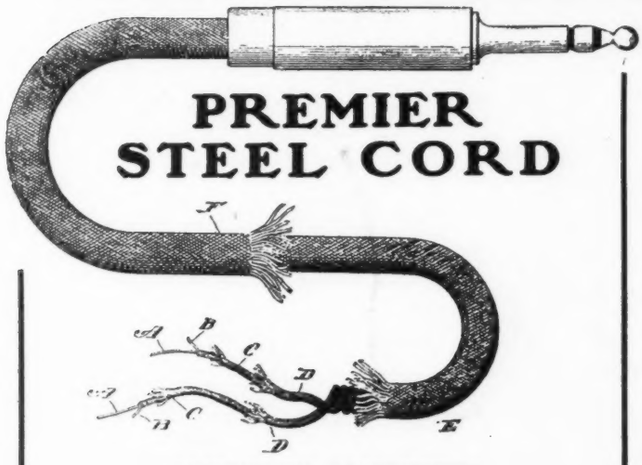
Specify Okonite wherever a Rubber Covered Wire is needed.

OKONITE IT NEVER DISAPPOINTS

Central Electric Company.

264-266-268-270 FIFTH AVENUE CHICAGO

OKONITE IT NEVER DISAPPOINTS



PREMIER STEEL CORD

ALWAYS IN ALIGNMENT

In the hollow of the cord at the plug end, there's a reinforcing spring made of the highest grade spring steel. Not only does this prevent the conductors from being thrown out of alignment, but it also makes it practically impossible to break the cord at the plug end, and that's where the strain is greatest. Operators don't have to be careful when you use Premier Steel Cord—it'll last in spite of shamefully careless usage. Better get details.

Runzel-Lenz Electric Mfg. Co.

97-101 South Clinton Street, Chicago

CIRCULAR LOOM

IN YOUR STORAGE BATTERY ROOM

AMERICAN CIRCULAR LOOM CO. TRADE MARK REGISTERED

Use Circular Loom for protecting and insulating your battery leads. Place Circular Loom around metal pipes running above the cells to protect them from fumes and to keep metal particles from falling off into the battery. It's neater and better than the ordinary boxing.

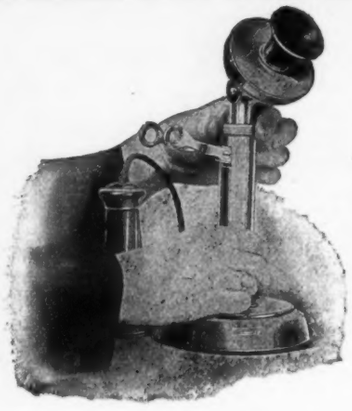
You'll find new Circular Loom uses for every day.

Order from your dealer or address

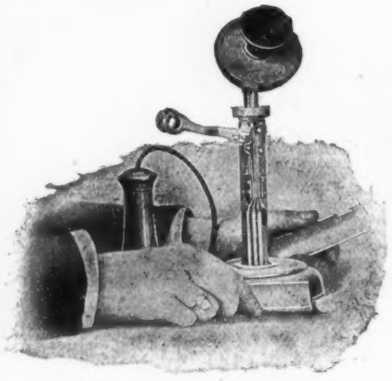
AMERICAN CIRCULAR LOOM CO.

BOSTON, MASS.

NEW YORK CHICAGO SAN FRANCISCO



To inspect the hook switch, loosen the knurled nut at top of stem. You do this with your fingers; there are no mysterious "catches" or patent spring locks to monkey with.



As soon as the nut is loose, the casing may be removed. Now you can see every working part and every wire, and yet every part is operative. There is not a sliding contact in the stand. Every connection is soldered.

By removing **one** screw in the center of the base, the cord terminals are reached. These are of generous size, so you don't need a watchmaker's screwdriver to put in a new cord.

The hook lever is the part that usually "gets it" when the stand is knocked over, so we put this on with a screw. Another lever can be put on in an instant, as shown. No adjustments.

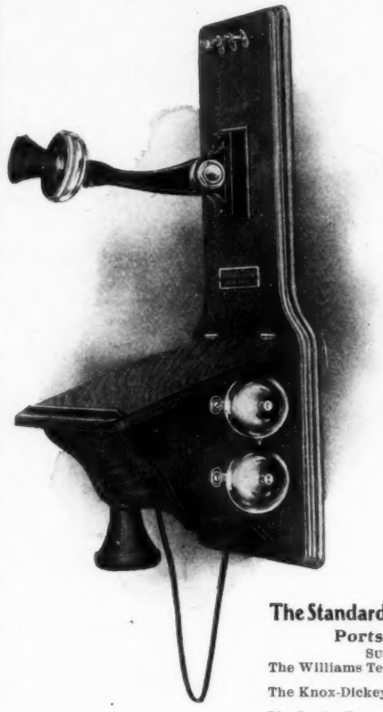
WHY do some stands pull apart into many different pieces? You can't test them when they are apart, and can't see the parts when they are together. What's the use?

Get our Bulletin No. 63

The Sumter Telephone Mfg. Co.

SUMTER, S. C.

Would You? Sure You Would



be interested in a perfectly successful four party selective system?

We have it and are prepared to demonstrate it conclusively to you.

Common Battery or Magneto systems equally satisfactory.

You need our apparatus. We want your inquiries.

The Standard Telephone Mfg. Co.

Portsmouth, Ohio

SUCCESSORS TO

The Williams Telephone & Supply Co., Cleveland, O.

The Knox-Dickey Telephone Mfg. Co., Portsmouth, O.

The Drake Telephone Co., McConnelsville, O.

If you haven't our new catalog, we regret it

If You Consider THE POOLE Lock-Out System

as an addition to party-line service, you are wrong. It is not something added—it is a feature which has always belonged to good service. It unfailingly gives absolute

SECRECY

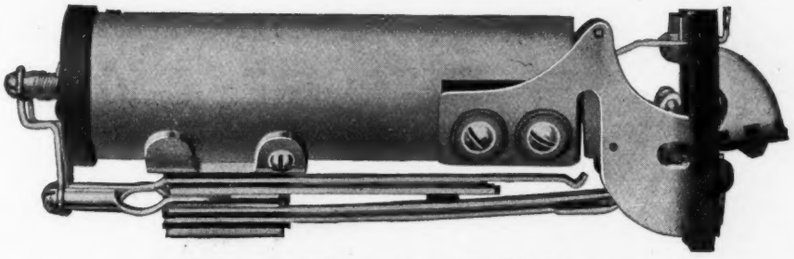
to any of the parties on the line. It gives the subscriber all the advantages of a private line at the cost of a party line. It enables you to put more parties on a line, and get higher rates.

Now, do you want details?

Mountain State Electrical Co.,

Wheeling, W. Va.

No. 8 Self-Restoring Gravity Drop



150-Line Magneto Switchboard

TWO SECTIONS—UNIT TYPE—FOOT RAIL BRACKET

Quality Woodwork

¶ The only switchboard Cabinets that wear as well as they look. All made in our factory.

¶ The cable forms inside are neatly and conveniently arranged.

Quality Apparatus

¶ The kind of tool-made apparatus that lasts long after quality is forgotten.

¶ Every piece of apparatus in this board is "Quality Apparatus."

A 5360 Oak Switchboard Cabinet—Mission Finish

¶ To the Man-Who-Buys—the real question is: "What KIND of service is this switchboard going to give me five years from now?"

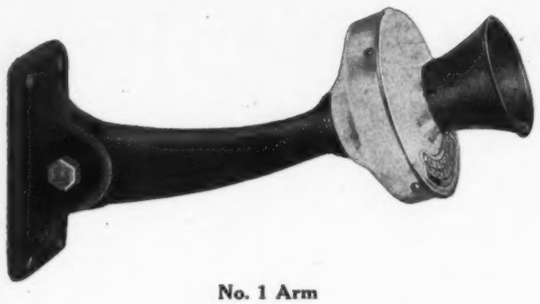
¶ *Ask yourself that* when you are selecting a magneto switchboard equipment.

¶ *Stromberg-Carlson* Magneto Switchboards are recognized everywhere as the very HIGHEST TYPE of strong, simple, clever construction, combined with most durable and lasting finish, PLUS the most efficient and economical Quality Apparatus that lasts.

Tell Us Your Needs—We Will Gladly Submit Prices

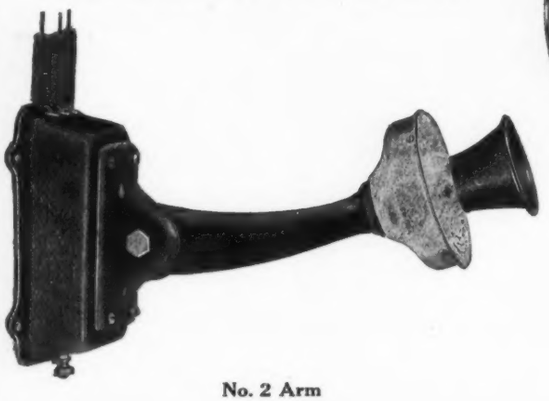
STROMBERG-CARLSON TEL. MFG. CO.

ROCHESTER, N.Y.-CHICAGO, ILL.



No. 1 Arm

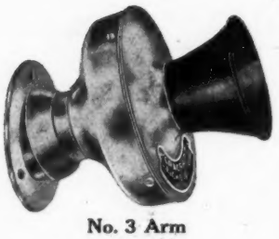
LOCAL BATTERY TRANS. NO. 1L.
COMMON BATTERY TRANS. NO. 1C



No. 2 Arm

Are These Transmitters Headed Your Way?

We Want Your Transmitter Business
They Make Satisfied Customers



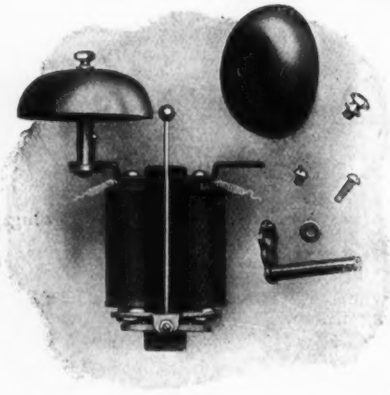
No. 3 Arm

Cracraft, Leich Transmitters are alive and ready to transmit the first as well as the last syllable the instant the receiver is removed from the hook.

WRITE AT ONCE
For Information and Prices

Cracraft, Leich Electric Co.
GENOA, ILL.

A Slight Change



The accurate and simple adjustment, the substantial construction, and the other features which have made ours the best and most reliable ringer produced remain the same as when first designed, but there has been a slight change in the mounting.

Up to this time we have made the ringers and gongs separate, while now we make them combined in a single unit. With the new arrangement the gongs do not depend on the cabinet for support and therefore the adjustment cannot be altered by weather conditions affecting the wood.

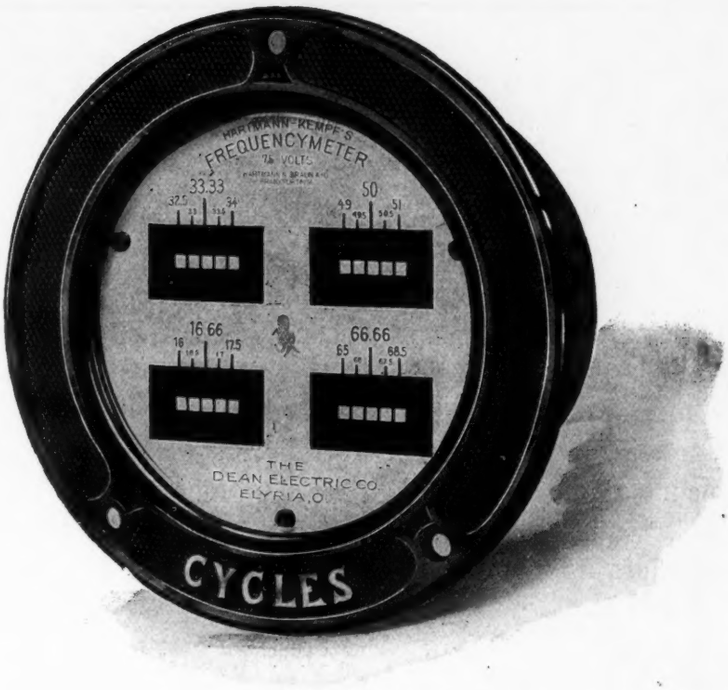
This change makes the gong adjustment more dependable and facilitates the mounting of the ringer. It is an additional evidence of our efforts to make each part of our apparatus accessible and reliable.

Let us send you a catalogue showing what we have accomplished in this direction.

MONARCH TELEPHONE MFG. CO.

Factory and General Office:
Washington and Morgan Streets, CHICAGO, ILL.

Branch House:
177 Main Street, DALLAS, TEXAS



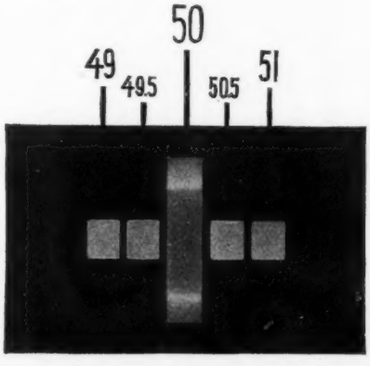
SCIENTIFIC SELECTION

¶ **The "Dean" Harmonic System** is still the only successful party line selective ringing apparatus in the world.

¶ **Absolutely no Failures** is the "Dean" record since the introduction of our Harmonic Converter (registered trade-mark) and our Harmonic telephones.

¶ **No working Installations** can be shown by some of the makers of imitating appliances—hence the long list of "Dean" successes is abundant proof of superiority.

¶ **Even the Slightest** uncertainty is now eliminated —"Dean" selective ringing is an exact science through the use of the



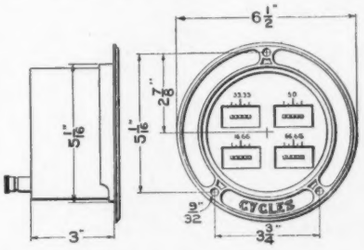
Hartmann-Kempf Frequency Meter.

¶ **With this Instrument** the number of cycles per second may be readily determined—the reading is instantaneous.

¶ **Plain Readings** are indicated by the reeds which vibrate as illustrated. Each of these reeds is a separate unit, even if one should be broken, the efficiency of the others would not be impaired.

¶ **Their Permanency** has been proven by three years' continuous vibration before the invention was marketed.

¶ **Hartmann-Braun, A. G.,** the manufacturers, of Frankfort a /M, Germany, have made us the American sales agents for this special instrument.



¶ **The Exact Dimensions** are shown in this drawing. The meter may be mounted in a portable case, or on a suitable mounting board above your power panel; or, it may be specified for any new "Dean" board.

¶ Send for Dean Folder No. 15.

The Dean Electric Company

ELYRIA, OHIO, U. S. A.

San Francisco **Kansas City**

Those Who Have Given

the matter much thought agree that ideal switchboard operation requires the factor of human intelligence and the elimination of the factor of personal error. ¶ This presupposes that all purely mechanical operations should be performed by a machine and that dissimilar operations to meet the exigencies of the service should be performed by skilled operators. ¶ Formerly one group of managers contended that all operations should be manual, another group that all operations should be mechanical. ¶ The Clement Automanual System is based on the rational, "middle of the road" policy and contains many new and improved features which you cannot afford to ignore.

Trade mark
AUTOMANUAL
Reg. U. S. Patent Office

The North Electric Company

DALLAS Cleveland KANSAS CITY

M. DONNELLY, PRESIDENT. J. M. RIEGER, SECY AND TREAS. F. P. DIEMER, GEN'L MANAGER

THE NAPOLEON
HOME TELEPHONE CO.

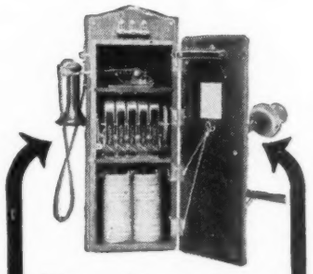
Napoleon, Ohio. Aug 15th 1908

Long Distance Tele. Mfg Co.
South Bend Ind.

Gentlemen:

In reply to yours of the 1st inst, will say that we are more than pleased with your telephones, We have several Country lines equipped with L.D. telephones and to date we have not made a single trip, or had a complaint from those lines. The only trouble I have is that my old customers are kicking for the duplex telephone.

Yours Very Truly
F. P. Diemer Mgr.



Who's Your Driver

How much does he cost you a month and how much for livery bills? How much could you reduce this expense if your troubles were confined to line troubles and all your telephones were working 24 hours a day and 365 days in the year?

Wouldn't this saving soon pay the difference between the cost of an Andrae Giant and that of the ordinary telephone? Say nothing of the satisfaction of keeping your service right up to the top notch.

There is no economy in cheap telephones. The strongest, best wearing and only real trouble proof instrument is the Andrae Special Heavy Giant. Because of its strength and durability it saves in maintenance charges much more than its cost. Try them and learn for yourself.

Julius Andrae & Sons Co.
48 Years Hustling at MILWAUKEE

There Are Some Features About

Ericsson Multiple Switchboards

That The "Other Fellow" Can't Duplicate

On our 2800 capacity Common Battery and Magneto Multiple boards, **the top of the multiple is only 57″ from the floor**—that's where the multiple begins on boards of other makes.

Figure out the operator's reach on **this** multiple board and see how it compares with **others** you have seen.

You cannot find another switchboard where **150 self-restoring drops with jacks** are fitted in a panel **7″ x 21½″** and where **one single nut** holds the individual jack and drop in the panel.

Don't you realize what it means **to your service** and **to you** if your board is built so that your operator has **all the subscribers** within **short** and **easy** reach?

If not, ask your operator what she has to say. Perched on a high and most uncomfortable stool, the strain of the long reach will make her tired and indifferent, and your service will suffer.

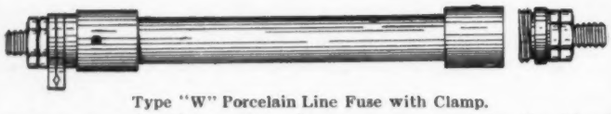
You know who will have to answer the complaints.

It certainly is worth your while to investigate and find out how some of your present troubles may be avoided.

L.M.ERICSSON TEL.MFG.CO.
BUFFALO, N.Y.

AMERICAN PORCELAIN FUSES

TRIPLE LENGTH OF FUSE WIRE



Type "W" Porcelain Line Fuse with Clamp.

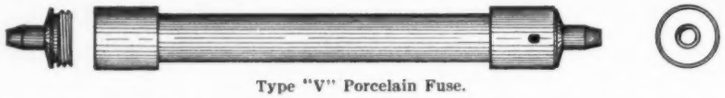
Two new American Porcelain Fuses are here illustrated. They are of a new design and possess distinct merits in comparison with other fuses.

The fuse tube is made of unglazed porcelain, which is made extra tough and strong by a special process. Porcelain, of course, is a perfect insulator, and, being porous, permits the escape of gases generated by the blowing of the fuse.

But the most important and novel advantage of the American Porcelain Fuse lies in the way that the fuse wire is passed through the tube. The tube contains three holes or channels for the wire, instead of the one hole of ordinary fuses. The wire is passed through the tube in one hole, then back again through a second hole and again back through the third hole, the two ends of the fuse wire then being exposed at opposite ends of the tube. This gives three times the length of fuse wire in the same length of tube, and makes the safest fuse on the market to-day. It also makes it possible to mount fuses in a smaller space than can be done with any other fuse. The fuse terminals are made in two pieces, a "ring" and a "head." The ring is permanently fastened to the porcelain tube, but the head is removable. The fuse wire is soldered to the ring, through a hole in the side, and then the heads are screwed into place in the rings. The unscrewing of the heads exposes the fuse wire for inspection or repair.

Cross Section American Porcelain 3 Way Fuse

This new design of American fuse has been made up in two standard styles as shown in the illustrations, one style being for use as a line fuse with clamps (Type W,) and the other style being made plain for use in cable boxes, etc. (Type V.) The principle of the "three way" fuse is the same in both styles. American Porcelain Fuses are the safest fuses made, because within the same length as ordinary fuses, they afford three times the ordinary fuse wire length. They also are the most easily renewed of any fuses on the market.



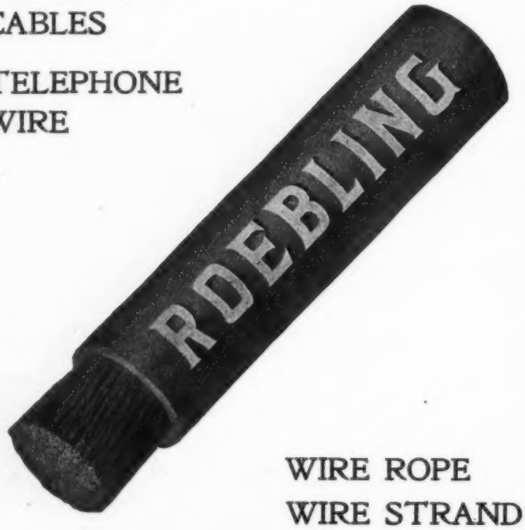
Type "V" Porcelain Fuse.

AMERICAN ELECTRIC FUSE CO.

MUSKEGON, MICH. - - - - - NEW YORK, N. Y.

TELEPHONE CABLES

TELEPHONE WIRE

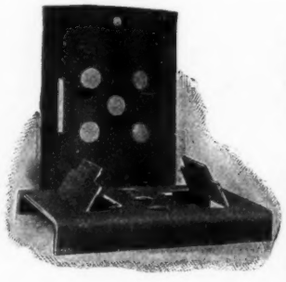


WIRE ROPE
WIRE STRAND

JOHN A. ROEBLING'S SONS CO.

TRENTON, N. J.

BELDEN STEEL GAINS



A practical and economical steel support for attaching cross arms without cutting gain in the pole.

Write for prices and description of the 14 sizes we make for telephone, telegraph, electric light and power transmission work.

BELDEN GROUND CLAMPS

Contain greatest strength with lowest price and the one size will fit any size of pipe.

Screw driver and pliers only needed for attaching.

BELDEN MANUFACTURING COMPANY

194 MICHIGAN STREET, CHICAGO

Central Energy Telephones
for Long Distance Exchange Service

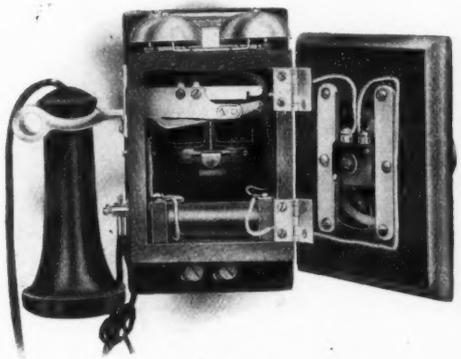
For Hotels, Schools and Residences

Closed View

Most Compact and Most Accessible Phone Ever Built

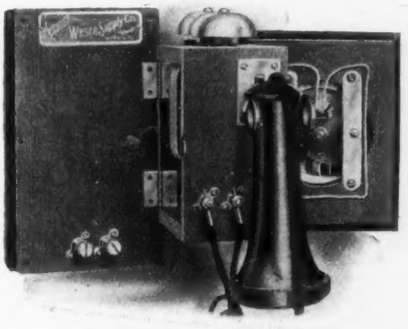
Absolutely the smallest, yet most perfectly constructed 'phone of its type on the market

Send us your specifications covering your requirements on complete Central Energy



Door Open, Showing Interior View

Lamp Line Equipments for Hotels, Schools, Etc.



Showing Door and Body of Phone Open, giving access to all parts

The Wesco Supply Company

Manufacturers

High-Class Telephone Apparatus

Main Office and Factory: St. Louis, Mo. Branches: Fort Worth, Tex., and Birmingham, Ala.

"ROBERTS" AND WHAT IT MEANS

WHY

Limit Your Party Lines To Four Or Eight Parties on a Line?

WHY NOT

Put Twenty Or Forty Parties On A Line?

PARTY FORTY

Selective Ringing System
Secret Service

PARTY FORTY

The ONLY LIMIT To The ROBERTS SYSTEM Is The TRAFFIC LIMIT

If YOU Want To Know MORE About The BEST Party Line SYSTEM On The Market

WRITE TO

HOMER ROBERTS TELEPHONE CO., 1703 Melrose St., Chicago

HOMER ROBERTS TELEPHONE CO.
1700 Melrose St. Chicago

Operator's Calling Device

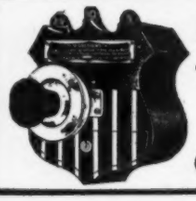
BAIRD PARTY-LINE SECRET-SERVICE TELEPHONE SYSTEM

Nineteen or less parties on one magneto line. All "rubbering" prevented. The very best toll service from any telephone without interference or listening in.
Absolutely private service insured to every subscriber.
A long list of delighted customers show approval by many repeat orders.
Every telephone controlled by operator, who can lock in or lock out.

Write for Catalogue and Testimonials.

BAIRD MANUFACTURING CO., 1602 No. Halsted St., CHICAGO

Write for Baird Pay Station Bulletin No. 250.



DO YOU WANT WHAT'S DUE YOU?

THEN INSTALL GRAY PAY STATIONS AND YOU'LL GET IT

All details are in Catalog No. 50. Write for a copy.

GRAY TELEPHONE PAY STATION CO., Hartford, Conn.

Insulated Staples

4 Sizes

Pat. Nov. 1900

BLAKE
TUBE FLUX for SOLDERING

Full Size of Tube, 1" x 5"

Patented Feb. 4, '08

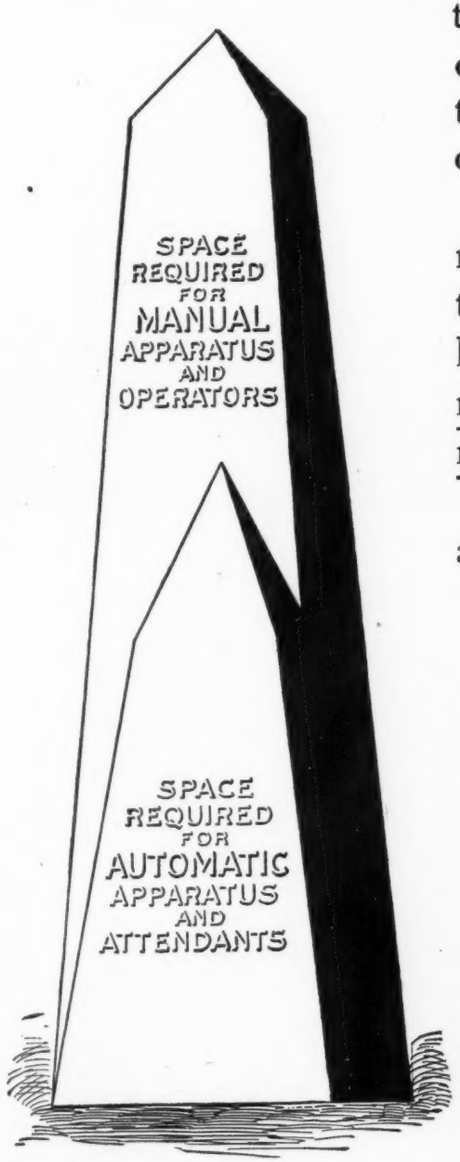
COMPRESSED CLEATS FOR USE ON PLASTERING

EXACT SIZE PAT. JULY 1906

BLAKE SIGNAL & MFG. CO. WRITE FOR SAMPLES **246 SUMMER ST., BOSTON, MASS.**

A MONUMENT PAYS NO DIVIDENDS,—

so why erect a large palatial building for housing manual central office equipment when a smaller, cheaper and simpler one will hold automatic telephone equipment of equal capacity.



With automatic telephone equipment you need no operators, and therefore, no wide stairways, no wide halls, no high ceilings, no rest room, no library, no kitchen, no lunch room, no hospital and no locker room.

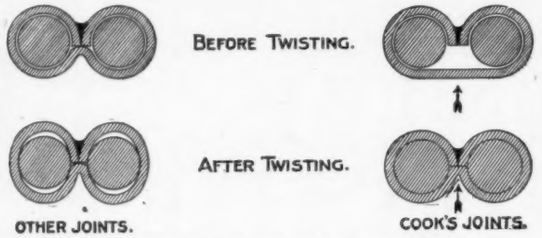
Our Automatic System has been adopted in the following cities:

Aberdeen, South Dakota.
Akron, Ohio.
Allentown, Pennsylvania.
Auburn, Maine.
Auburn, New York.
Battle Creek, Michigan.
Beaver Falls, Pennsylvania.
Bellingham, Washington.
Berkeley, California.
Billings, Montana.
Butte, Montana.
Cadillac, Michigan.
Champaign, Illinois.
Chicago, Illinois.
Cleburne, Texas.
Columbus, Georgia.
Columbus, Ohio.
Dayton, Ohio.
Decatur, Illinois.
Dowagiac, Michigan.
Edmonton, Alberta, Canada.
El Paso, Texas.
Emaus, Pennsylvania.
Fall River, Massachusetts.
Grand Rapids, Michigan.
Hastings, Nebraska.
Havana, Cuba.
Hazleton, Pennsylvania.
Holland, Michigan.
Hopkinsville, Kentucky.
Houston, Texas.
Jonesboro, Arkansas.
Kenton, Ohio.
Lake Benton, Minnesota.
Lansing, Michigan.
Lewiston, Maine.
Lincoln, Nebraska.
Los Angeles, California.
Manchester, Iowa.
Marianao, Cuba.
Medford, Wisconsin.
Mount Olive, Illinois.
New Bedford, Massachusetts.
Norfolk, Nebraska.
Oakland, California.
Ocean Park, California.
Omaha, Nebraska.
Pontiac, Illinois.
Portland, Maine.
Portland, Oregon.
Princeton, New Jersey.
Richmond, Indiana.
Riverside, California.
Rochester, Pennsylvania.
Rushville, Indiana.
San Diego, California.
San Francisco, California.
Santa Monica, California.
Saskatoon, Sask., Canada.
Sioux City, Iowa.
South Bend, Indiana.
Spokane, Washington.
St. Marys, Ohio.
Strathcona, Alberta, Canada.
Tacoma, Washington.
Toronto Junction, Canada.
Traverse City, Michigan.
Urbana, Illinois.
Van Wert, Ohio.
Wausau, Wisconsin.
Westerly, Rhode Island.
Wilmington, Delaware.

Automatic Electric Company

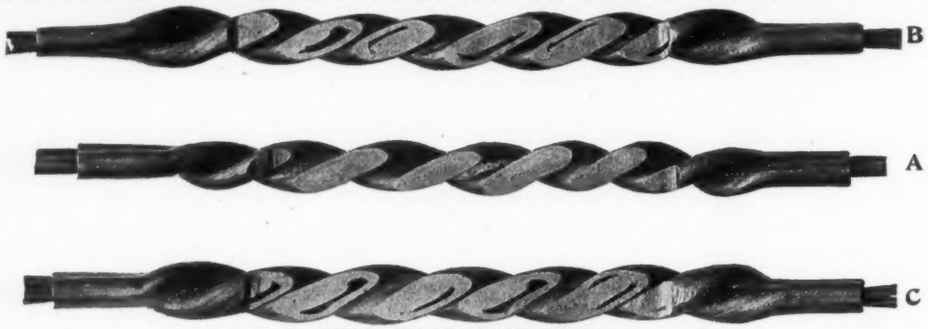
Van Buren & Morgan Streets

Chicago, U.S.A.



Cook Self-Welding Wire Joint

In the Cook Joint the mere act of twisting draws the sleeve into the recess between the wires, stretching it absolutely tight around both wires, making a perfect self-weld
A joint made with the COOK SELF-WELDING JOINT is stronger than the wire itself.
When a twisted joint is cut in two it is impossible to see where the metal in the joint ends and the wire begins.
Moisture or air cannot penetrate and corrode the wire and the joint. The Cook Self-Welding Wire Joint insures a permanently perfect connection.



WIRE JOINT COMPARISON

A—Cook No. 10 with 1 No. 10 and 1 No. 12 Wire. B and C—Competitor No. 10 Joint with 1 No. 10 and No. 12 Wire.

The Cook Joint will give perfect results as a combination joint, when the wires used are not more than two gauges apart. All sizes For Copper or Iron Wire. No. 18 to No. 0000

Frank B. Cook.

242 W. LAKE ST. CHICAGO, ILL.

Sound Proof Booths

Nothing Better Made

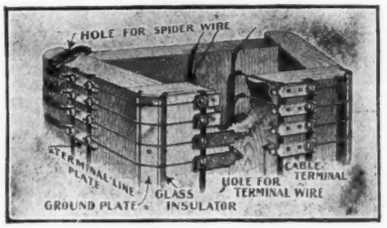
Send for Catalogue and Prices

We carry a complete stock and can usually ship the day order is received.

We also manufacture bank, office and store fixtures.

Fisher-Stevens Co., CHARLES CITY, IOWA

This Can-Top Cable Terminal



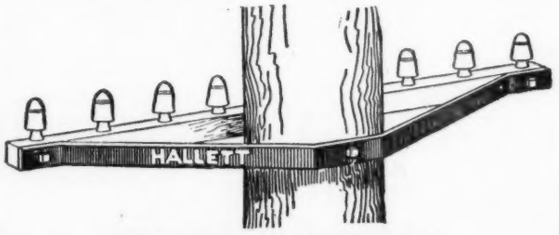
Will give you the best protection and costs much less money than other terminals.

New illustrated catalog just out. Get one before buying.

THE PROTECTIVE ELECTRICAL SUPPLY CO.
FORT WAYNE, IND.

CROSS ARM BACK BRACES

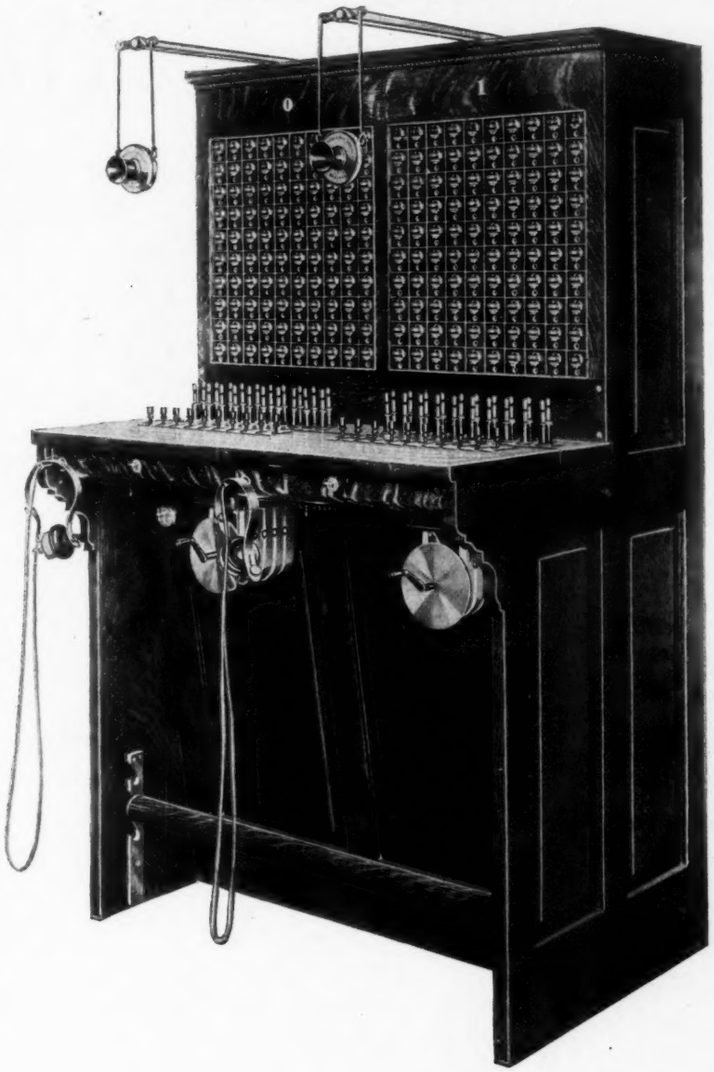
hold the cross arm rigid, which makes Telephone construction work more permanent. We make the braces of flat material or angle iron



HALLETT IRON WORKS

92-96 W. Polk Street, CHICAGO, ILL.

200 Line Switchboard with 200 Unit Type Self-contained Drop and Jacks installed



"Switch-Boards"

We can furnish switch-board of any desired capacity. You can have your cabinet wired to its full capacity, install number of drops you actually have use for and add additional ones from time to time as needed, one at a time if desired. You are not required to buy a bank of five or ten if only two or three are needed. Your money invested only in equipment that is earning something for you.

Our central office equipment has features of distinct advantage not found in other makes. A little investigation will prove this to you conclusively. You will favor yourself by investigating our apparatus, getting our specifications and prices before placing your order elsewhere. We solicit your inquiries and invite your critical investigation of our products.

Ask for complete
Specifications, Blue Prints
and
Illustrated Literature
Prices on Application

Type of Drop and Jack used in above Illustrated Switch-Board
Note Coil Removing Feature

Swedish-American Telephone Co.

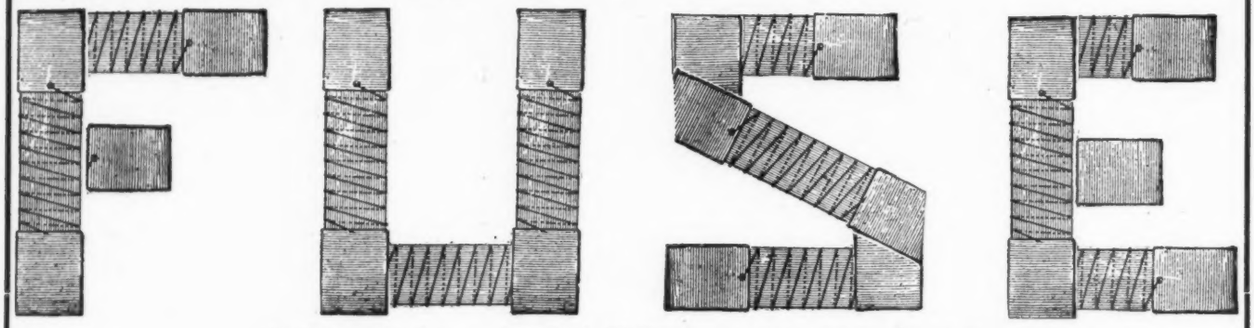
Chicago

BRANCH, KANSAS CITY, MO.

USE THE BEST COSTS NO MORE

6 times the fuse length
18 sharp angles for impedence
Special wire accurately rated, not easily broken. Tinned copper terminals, can be used on any standard W. W. block

No. 1 Patent Wrapped



Length, 2 inches. Per 100, $1.25. 500 lots, 10 per cent discoun

Order of Your Dealer
or of
CENTRAL
TELEPHONE &
ELECTRIC CO.
ST. LOUIS - DALLAS

P. S.—Our Bulletin 28 shows complete line of lightning protective devices. All good. Like all our bulletins free for the asking.

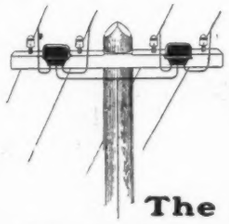
DESIGNED BY PRACTICAL MEN

The Sky Rocket Arrester

Made for practical work, and they do it right. Their mission is to protect your lines from charges of excessive potential whether due to lightning or other causes, and they fulfill this mission invariably and infallibly.
Details, prices and references await your inquiry.

CHANCE MANUFACTURING CO.

CENTRALIA, MO., U. S. A.

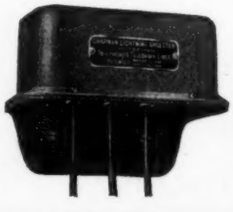


Pick a Winner

The Chapman Lightning Arrester contains no pet theories to be exploded by the first storm. Just a delightful combination of common sense and experience put up in a substantial package which improves with age.

Installed at intervals along a line, they form natural spillways for lightning and static disturbances, and are as permanent as the pole line.

Every arrester is tested and adjusted to a standard spark gap before shipment.

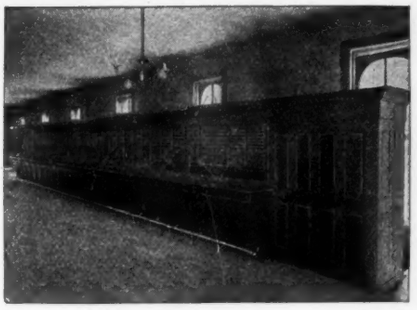


Manufactured by

MINNESOTA ELECTRIC CO.

Minneapolis, Minn.

A Complete Equipment for a 6000 Line Common Battery Exchange



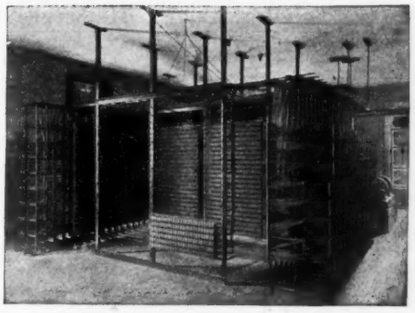
6000 Line Board
3000 Installed

This Plant was Recently Installed by the

Sterling Electric Co.

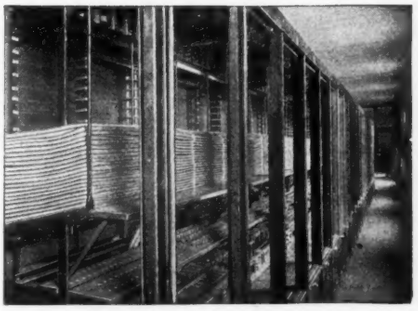
and is Giving Excellent Service

Power Plant



Relay Rack, Main and Intermediate Distributing Frames

Sterling for Service



Rear View of Switchboard

House of Good Goods

Wire Chief's Desk

WE ARE PREPARED TO FURNISH EXCHANGE EQUIPMENT

FOR ANY CLASS OF SERVICE

Sterling Electric Co.
LaFayette, Indiana

Toll Desk

Double the Life of Your Poles

TEN TIMES the Strength of Creosote

ANTISEPTINE
Regis. U. S. and Can.

Doubles the Life of Poles and Cross Arms
The Perfect Cold, Hot Brush and Open Tank Timber Preserver

AMERICAN WOOD PRESERVING CO.
Incorporated 1892
430 THE ROOKERY
Phone Harrison 1345
CHICAGO
Write For Full Information

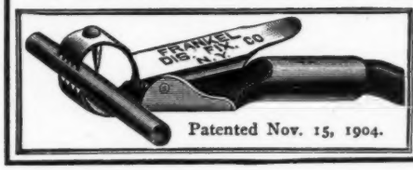
"THEY NEVER PULL UP"
THE MILLER SAFETY ANCHOR
Ask Nearest Jobbing House for Prices. One Dozen on Trial. Freight Prepaid.
Write for Catalogue
THE MILLER ANCHOR CO., NORWALK, OHIO

EASY WAY TO TEST

And locate trouble on grounded and metallic lines, measure resistances of coils, ringers, etc., described in our new catalog of portable and switchboard voltmeters and ammeters. Send for it. It's free.

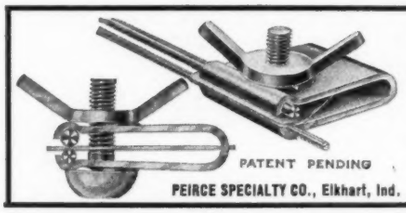
L. M. PIGNOLET
80 Cortlandt St., New York

Frankel's Electric Testing Clips



Patented Nov. 15, 1904.

Sample Doz. - 12½ Cts. Each
100 Lots - - 11 " "
500 " - - 10 " "
1000 " - - 9 " "
From your supply house or
FRANKEL DISPLAY FIXTURE COMPANY
733-735 Broadway, New York U. S. A.



PATENT PENDING
PEIRCE SPECIALTY CO., Elkhart, Ind.

PEIRCE
Test Connectors
Fit any size wire
HEX. OR WING NUTS for copper or iron
CHEAPEST — BEST

EXCEPTIONAL OFFER

We are placing on the market, the entire **Central Office and Sub-Station Equipment** of the **Georgia Telephone & Telegraph Co., Savannah, Ga.** Below we list a portion of this equipment, which is in excellent condition:

1 Stromberg-Carlson common battery Switchboard, complete with Sterling Electric Co.'s Main and Inter. Frames.
1600 Stromberg-Carlson Wall sets, equipped with cords, transmitters and receivers.
587 Stromberg-Carlson Desk Sets, equipped with cords, transmitters and receivers.

741	Stromberg-Carlson Transmitters,	Types—
682	" Receivers,	Types—
55	" Transmitters, (new)	Type—
75	" Receivers, (new)	Type—
1	" Pay Station, Cabinet.	

In addition, we have a large number of repeating and induction coils, generators, condensers, coin collectors, service meters and repair parts. For detail information and prices on a whole or part, address

ABRAHAMS & CO., Savannah, Ga.

WESTON

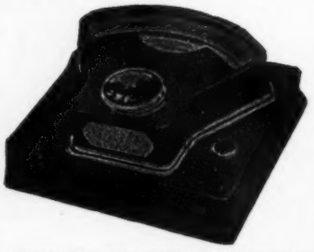
STANDARD PORTABLE DIRECT READING

VOLTMETERS, AMMETERS, MILLIVOLTMETERS, VOLTAMMETERS, MILAMMETERS, OHMMETERS, PORTABLE GALVANOMETERS, GROUND DETECTORS AND CIRCUIT TESTERS

Our Portable Instruments are recognized as THE STANDARD the world over. Our STATION VOLTMETERS and AMMETERS are unsurpassed in point of extreme accuracy and lowest consumption of energy.

Weston Electrical Instrument Company

Main Office and Works, Waverly Park, Newark, N. J.
London Branch—Audrey House Ely Place, Holborn.
Paris, France—E. H. Cadiot, 12 Rue St. Georges.
Berlin—European Weston Electrical Inst. Co., Ritterstrasse No. 88.
New York Office—74 Cortlandt Street.



Weston Standard Portable Direct Reading Voltmeter. Model 1.

Renewing Batteries by Guesswork

Costs money and means poor service. Test them with a

CONNECTICUT POCKET METER

and know their condition. Its use will decrease complaints, improve your service and save money. Fully described in Circular T.

CONN. TELEPHONE & ELECTRIC COMPANY, Inc.
MERIDEN, CONN.

Telephony.

THE AMERICAN TELEPHONE JOURNAL

Comprising Telephony, American Telephone Journal, Sound Waves, The Telephone and The Telephone Magazine

Vol. XVI CHICAGO, SATURDAY, SEPTEMBER 19, 1908 No. 6

PUBLISHED EVERY SATURDAY BY THE

Telephony Publishing Company

Monadnock Block, Chicago

Telephone Harrison 2951

H. B. McMeal, President F. S. Kenfield, 1st Vice-President
W. H. Graffis, 2d Vice-President H. D. Fargo, Secretary-Treasurer

Edited by H. B. McMeal and Franklin H. Reed

The present publication comprises

Vol. 55	The Telephone	No. 6
Vol. 32	Telephone Magazine	No. 6
Vol. 18	American Telephone Journal	No. 12
Vol. 16	Sound Waves	No. 6
Vol. 16	Telephony	No. 6

TERMS OF SUBSCRIPTION:

United States, Canada, Cuba and Mexico.....per year, $2.00
Other Foreign Countries within the Postal Union..... 3.00

NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon of Monday for the paper dated Saturday of the same week.

Copyright, 1908, by Telephony Publishing Company

Entered as second-class matter March 8, 1901, at the post office at Chicago, Ill., under act of March 3, 1879.

CHICAGO, SATURDAY, SEPTEMBER 19, 1908

CONTENTS.

Editorial 249
Telephone Service at the Minnesota State Fair. By Percy G. Robinson 251
Locating Split Pairs in Cables. By Henry W. Fisher.....253
The Preservative Treatment of Loblolly Pine Cross-Arms. (Concluded.) By W. F. Sherfesee.....255
The Subscribers' Station Records. By Geo. S. Houston.....258
Some Dry Cell Pointers. By L. W. Carroll.....259
The Operator. By H. E. Davis.....260
Horses in Telephone Circuits.....262
Saskatchewan's New Telephone Policy and Construction Projects 262
Independent Methods and Progress at Terre Haute, Ind.....264
Telephone Law. By A. H. McMillan.....265, 266
Telephone Finances 266, 267
Practical Questions and Answers.....268, 269
The Canadian Convention. By W. R. Rutherford.....269
Letters on Practical Subjects.....271
An Interesting Toll Line Test. By Jno. B. Doolittle.....271
Telephone News 272, 273, 274, 275
Telephone Patents 275, 276, 277
In the Manufacturing Field.....277, 278
Condensed News Reports.....278, 279, 280

Good Progress for a Dull Year.

In the annual report of the Citizens Telephone Company, of Grand Rapids, summarized on another page, are figures showing that, during the past year, in its principal exchange, the number of subscribers' stations has increased by more than 5.6 per cent, while over the entire system the growth amounted to about 3 per cent. Not only did the returns from local and toll service fail to show the tremendous diminution which has not been avoided by any other class of business, but actually there was an increase of more than 7.7 per cent in gross receipts. The excess of this ratio over that of station growth shows exceedingly healthy development tendencies. A further item of strength, which might well have been mentioned in the report more specifically, is that the company, during this past year when a market for other securities was almost non-existent, sold at par not only sufficient stock to pay for all additions and betterments made to its plant, but to reduce, in the 11 months ending August 31, 1908, its floating indebtedness by no less a sum than $130,000. This exhibition of strength is attracting favorable comment throughout the field.

We also publish, this week, abstracts from the report of the Keystone company, of Philadelphia, which has been able to substantially increase its gross earnings during the past year, and further fortify its financial position by a $100,000 addition to its already large accumulated reserve for renewals. President Folwell is quite justified in saying: "If the company can make such a showing under adverse conditions, it foreshadows a most successful future when normal conditions have been fully restored."

Such experiences as these, which are by no means confined to the two companies mentioned, but are general for well managed companies in all parts of the country, confirm most fully the belief long held by operating officials, that telephones once installed are so necessary a factor in modern business and social affairs that even in times of financial stress the cancellation of contracts for this service as a measure of economy is not to be expected. Consequently, in good times or bad, investors in reliable telephone securities are assured of a continuous income based on the contracts with subscribers. In other words, the contracts for service, if originally made with a properly selected class of subscribers, represent a security which has come undisturbed through the fire of adverse circumstances during the past few troubled months, and demonstrated its fitness to stand as a guarantee of quality behind telephone investments. Permanence and steadiness of income from a well founded telephone property under good management is now to be anticipated as a natural and fundamental feature of the business, the existence of which has been demonstrated by a most convincing test.

A further lesson conveyed by the records of station growth instanced in the Citizens report, and others which are made by company after company, is that telephone development, rapid as it has been of late years, has indeed only made a good start. The orders for service which have come in unsolicited until most companies, after a few months of comparative inactivity

in construction work, now report cable facilities taxed to the utmost, are a sufficient indication of this if there were no other. But actual cash receipts are more expressive to the investor, not only as suggesting a basis for present action, but as furnishing data for forecasting the future. And it is natural to reason that, for every man who in the past few months has become so convinced that telephone service is necessary that he has been willing to make the outlay to secure it, there will be many new users in the future when all affairs have resumed their normal activity.

How Far Should a Telephone User Know How His Wants Are Supplied?

Total ignorance is one possible condition. It may safely be said that nearly all telephone subscribers know nothing of the construction or operation of a telephone switchboard. They have no idea of the duties which an operator may reasonably be expected to perform. They know only that they can talk to various people, a privilege for which they pay so much per month. The effect produced by this mental condition depends a great deal on the individual. Some men get an exaggerated opinion of the ability of the men who run the telephone system. Though telephone men, like others, are fond of appreciation, yet over-estimation is likely to lead to a fall some time. Most people pay little attention to it, accepting the inconveniences much as they do the other annoyances of life—a late train, a leaky roof, or a bad dinner.

Another class, not knowing how the telephone work is carried on, are led to expect too much and are exasperated by delays and interruptions. They imagine that the telephone operator has no other call to answer at the same time as their call is made, and therefore, if they do not get a prompt answer, blame it upon the operator. These develop into "chronic kickers"—people who never have a good word for the telephone company or its work. It does not take many such people in a community to make life miserable for the operators.

Perfect knowledge is an impossibility, for even those who have been at the business for years are still in the school of experience. Let us say that this means merely a knowledge equal to that of those in charge of the telephone exchange. It is impossible for all subscribers to be even this well versed in telephony and it is not certain that it would be any advantage to have them so. It certainly would be inconvenient for a telephone company which has anything to conceal. The answer, "It can not be done," would not cover their inability. Years ago, when telephones were scarce, a business man had a telephone in his office. Not hearing the bell in another room, he conceived the idea of having an extra bell to ring when the one on the main telephone did. To his request the telephone company replied that what he proposed was impossible—he would have to take one bell or none.

Partial knowledge embraces such information as the average subscriber will gain from a few visits to the exchange. The average man takes interest in seeing how it is done, and the wise manager makes it a point to show the visitor how calls are handled from start to finish. The subscriber will see why certain delays are unavoidable. He will see the proper limitations of the system. The telephone is no exception to the rule that all things of human origin perform their functions with considerable imperfection.

Seeing the exchange work is the best cure that has been devised for the unreasonable subscriber. It is the experience of many companies that the subscriber who was the most unreasonable has invariably been made better and more patient by seeing the operator at her work. Some companies do not like to take parties of visitors into the operating room during the busy hour, since the presence of many strange people detracts the attention of the operators from their work. While this is true, yet if there is one man who is unjust in his criticism or demands on the system, it will do him more good to see the operator at the busy hour than at other times.

The subscriber who has seen the exchange working will be more ready to co-operate with the company. If on a magneto exchange, he will see the necessity of ringing off and be more likely to do it. On a common battery exchange he will be less likely to work the hook savagely to recall the operator, if he has been shown its effects in the office. On the automatic system he will not force the dial back if he has been shown how it tends to give him wrong numbers.

On the whole, a subscriber is a better subscriber the more he knows how service is given. Managers will do well to urge the public to come in. The influential citizen, the day laborer, the average man—all should receive cordial treatment and clear explanations. It will make friends for the company, and these are needed in every place.

Encouragement from Wisconsin.

If straws show which way the wind blows, the indications are that the Bell company in Wisconsin is looking forward to meeting a rather more active campaign for extensions and new exchanges, on the part of its Independent competitors, than has been carried on for some time past. The Wisconsin company issues a monthly paper, part of which is devoted to live material, which cannot fail to be interesting and valuable to its employes. A further object, however, seems to be the creation of a public sentiment, not warranted by actual and general experience, against competition in the telephone business. As the officers of the company are able men, undoubtedly possessed of a fine sense of proportion, it seems fair to take, as a rough measure of the force and extent of the prospects of Independent activity in the territory partially occupied by their system, the magnitude of the efforts they exert to meet the competition.

The last issue of the company's paper contains eight pages, in which the leading article, and nearly a third of the entire space, is given up to discussion of the Independent telephone business. In our opinion, even in poorly developed Wisconsin, the Independent business is worth more space than this, but it is proper to make allowances for a natural tendency on the part of the editors to over-estimate the importance of the interests which are nearest them. And their action is mighty good advertising for the Independent business. It promotes inquiry, and it is indeed a poor Independent manager who, with the sources of real, reliable information at his command, cannot make a good showing to a fair minded inquirer.

Telephone Service at the Minnesota State Fair

By Percy G. Robinson

It is almost impossible for one who has never attended it to gain an adequate idea of the scope covered by Minnesota's great annual exhibition. The fair of 1908, lasting from Aug. 31 to Sept. 5, not only broke all former records for the State itself, but holds an enviable national record in many features. It had the largest attendance for one week of any similar fair in the United States, approximately 340,000 people having visited the grounds. Ralph De Palma cut down Walter Christie's world's automobile record on a circular track to 51 seconds flat, in a Fiat car. Purses for the racing events, amounting to $32,000, drew some of the fastest horses in the country to join in the exciting competition.

All in all, the Minnesota State Fair was, in its daily attendance and interest, larger in every respect than the expositions recently held at Portland and Jamestown. The grounds are located between St. Paul and Minneapolis, being a twenty-minute car ride from either city. This enables it to draw from a population of half a million residing within 20 miles. The grounds comprise 247 acres, with the finest of exposition buildings.

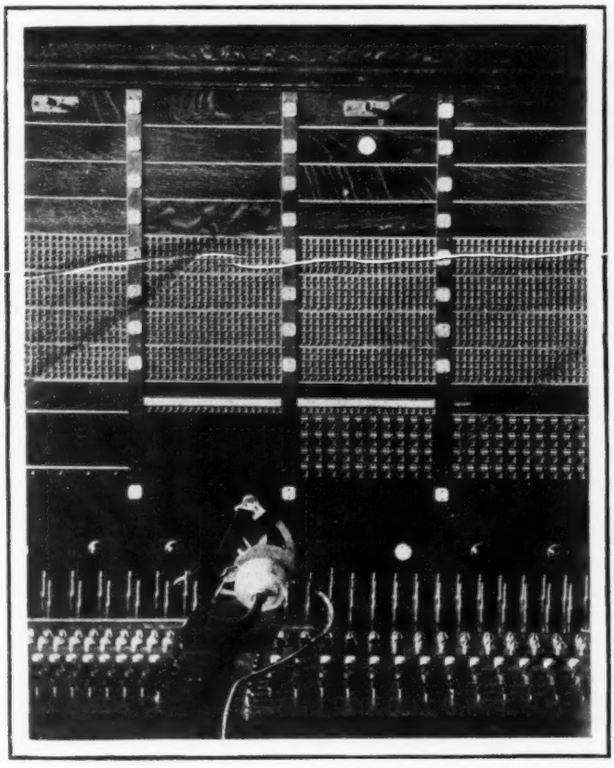


Fig. 1.—Portions of Trunk and Local Positions of Switchboard.

It is needless to say that in the handling of an exposition of this size, the most complete and efficient methods of communication must be utilized to expeditiously handle the exhibits and crowds. The device naturally adopted was the telephone, and the service chosen was that of the Tri-State Telephone and Telegraph Company (Independent).

The company placed in the main building a model common battery switchboard, with the necessary auxiliary equipment, which served not only as an exchange, but as an excellent exhibit. The contract department, fully alive to the value of the advertisement opportunity resulting from the selection of this company to serve the exposition, co-operated in making the exhibit interesting to the public, as well as fitted to admirably serve the visitors and officials at the exposition. The booth, wherein the exchange was located, is shown in Fig. 2. The board is shown near the center post; on the right, the public

Fig. 2.—Exhibit of Tri-State Telephone & Telegraph Co. at Minnesota State Fair.

pay station booths, from which a heavy daily business was transacted by visitors using both local and long-distance lines; and on the left is the exhibit of a manufacturer of telephone apparatus and equipment.

The board, which was of Dean manufacture, was an eight panel, 3 position, common battery multiple section, finished in quarter-sawed oak. One position was equipped as a regular trunk position, and the other two as local. The general arrangement of apparatus may be seen in Fig. 1, which shows a portion of the trunk position and a part of one of the local positions. Answering jacks are mounted 10 per strip, and

Fig. 3.—Telephone Switchboard Which Furnished Independent Service at the Fair.

the multiple jacks 20 per strip. The local positions are equipped with 15 cords each, and arranged for harmonic ringing. The trunk position, at the left, was equipped with 24 incoming trunks, these also being arranged for selective calling of sta-

tions on 4-party lines equipped with harmonic ringers. It will be noticed that, as is the usual practice in exchanges of the common battery type, there are no listening keys provided on the trunk position, supervision thereby being transferred to the operator originating the call. The bank of five jacks at the left, above the pilot lamps, are to impress the "busy

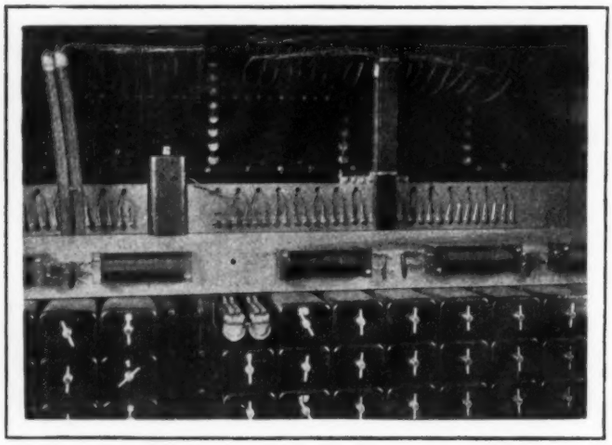


Fig. 4.—View in Rear of Switchboard.

tone" on a trunk, in case the line called is busy. The "busy" and "howler" tones were furnished from an automatic make and break arrangement of Dean make, the interrupting being accomplished by means of a peudulum arranged to vibrate with an appropriate periodicity. An excellent feature of the installation was the provision on each position of a cord and line test, by means of which the operator may test the cords, supervisory lamps, and line lamps, keys for accomplishing this being set at the right of each keyboard. This board, and the operators, who have waited long enough for the camera to click, are shown in Fig. 3.

Some idea of the arrangement in the rear of the sections may be gained from Fig. 4. The form at the top is for the answering jacks and lamps. Through the middle of the illustration may be seen the cord shelf, and the means of fastening the cords, with metal spade clips, which afford a convenient method of making connections.

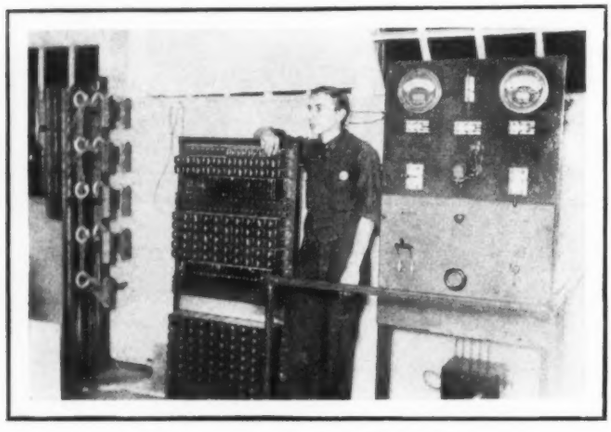


Fig. 5.—Terminal and Relay Racks.

As shown in the multiple, one hundred lines were equipped, and 96 of these were used. Trunk connections with the various exchanges in the Twin Cities and the toll board of the company were cared for by the following equipment: incoming trunks, 24; outgoing trunks, 22; toll trunks, 4.

The charging current was furnished by a 20 ampere G. E. mercury arc rectifier operating on a 110 volt, 60 cycle, single phase alternating current circuit. The rectifier tube was mounted behind the board, as has been the practice for some time past. The power panel, shown at the right of Fig. 5, carries the usual switches, voltmeter, ammeter, etc., arranged as a part of the rectifier panel. An auxiliary means of charging was provided, in case of breakdown of the a. c. circuit, by means of a 110 volt d. c. lead from the Fairbanks-Morse Company's exhibit of gasoline generator sets.

The storage battery comprised 80 Type PT chloride accumulator cells, arranged in 2 sets, each set being made up of 2 sets of 20 cells in multiple. These were mounted in sand, since the containing jars were of glass, and placed in a room apart from the board.

The relay rack is shown in Fig. 5, which also shows the terminal rack. From the terminal rack a 100-pair cable is distributed through the grounds, and a 50-pair cable, connected to the Merriam Park exchange, is used for trunks, order wires, etc. In addition to the 50-pair cable, aerial wires were brought in from the Merriam Park exchange on three 12-pin arms, and used for public pay stations throughout the grounds.

Around the track local battery, generator call telephones were installed as a means of following and timing the

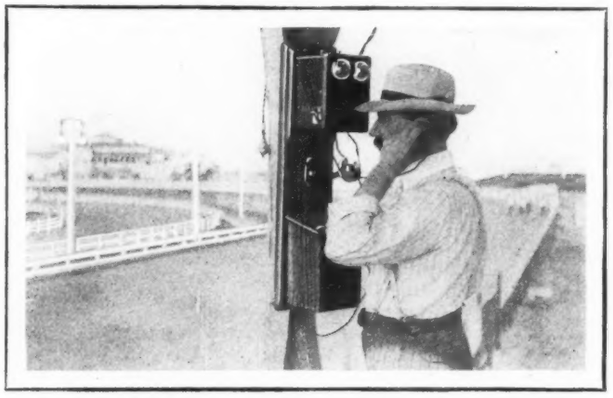


Fig. 6.—Telephone in Judges' Stand on Race Track.

races. These telephones were installed in the judges' stand; for the distance judge, 60 yards from the starting wire; in little towers, similar to switch towers, around the track; and in the paddock, stage, and office of the superintendent of amusements, for directing the vaudeville acts before the grandstand.

Using the Newspapers to Clear Trouble.

An ingenious plan for keeping rural grounded lines working well in an exceptionally dry spell of weather is revealed by the following item from the Paris, Ill., Beacon:

"The wire chief of the Kinloch Telephone Company reports that many complaints have been received within the past few days from rural patrons whose telephones are not working well. The cause has been found in most instances to be a peculiar one, the ground having dried out in such an extent that it fails to do service as a conductor. A very simple remedy is to pour a few buckets of water about the ground wire, which usually avails to correct the trouble. Subscribers can try this and if it does the work, will avoid delay in having their trouble righted."

When we get subscribers so they can clear simple troubles we approach an ideal condition. It is certainly worth while to see what a short item in the local newspapers will do, in such a case as the one referred to above.

Locating Split Pairs in Cables.

By Henry W. Fisher

Telephone cables are made up of twisted pairs, and when they are spliced no attempt is made to connect the pairs in any definite order. In fact most of the telephone companies mix the pairs of the different layers up as much as possible, thereby making the capacity of the pairs more uniform and the cable more efficient for telephone service. On account of this method of installation, it is rather difficult to locate split pair faults accurately.

Fig. 1 illustrates what is meant by a split pair. The wires *C* and *F* are connected straight through the cable, but *D* and *E* are cross-connected. If those two pairs are used for telephone service there will be more or less cross-talk depending upon the location of the transposition. Hence the need of locating the joint where the wrong connection has been made and rectifying the mistake. Some of the methods which have been used for locating split pairs are not reliable, giving only a rough approximation.

A practical method of locating these faults based upon relative capacity measurements has a very considerable value, and the methods devised by the author, and hereinafter explained, enable the location of the fault to be readily ascertained.

To do this a ballistic galvanometer, battery, condenser, and discharge key can be employed, but the writer prefers to use an alternating current or continually reversed direct current, a Wheatstone bridge or its equivalent, a condenser, and, as a current detector, a telephone, or, still better, a vibration galvanometer.

Instruments are now made which are suitable for this work, provided that the length of cable is great enough to obtain sufficiently discriminating values between the various tests made.

As the methods employed deal entirely with measurements of electrostatic capacity, which are ably described in many text and hand books, the writer will here only briefly show by diagram and description the arrangement of sensitive apparatus which was employed to verify the accuracy of the methods used.

Fig. 2 gives in diagrammatic form the connections and appa-

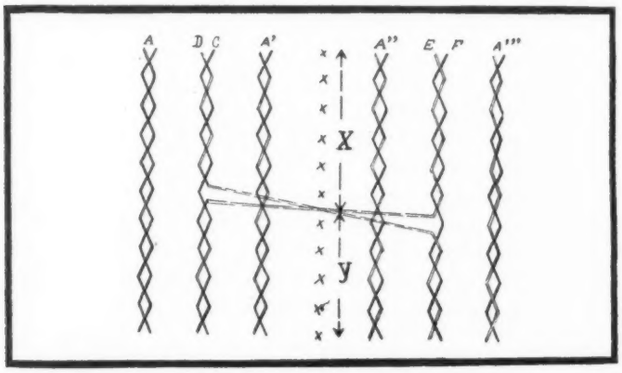


Fig. 1. Illustration of the Term "Split Pair."

ratus employed. *R*, *R'* and *R''* are non-inductive resistances, wound also so as to have a minimum capacity. *G* is the vibration galvanometer, *C* a standard condenser, and *A C* the alternating-current source which, by means of an electrically driven tuning-fork arrangement, was kept at a frequency that gave maximum vibration to the galvanometer needle. The resistance *R''* is needed to obtain the condition of balance or zero vibration of the galvanometer.

The plan of operation was to keep *R'* constant and vary *R*

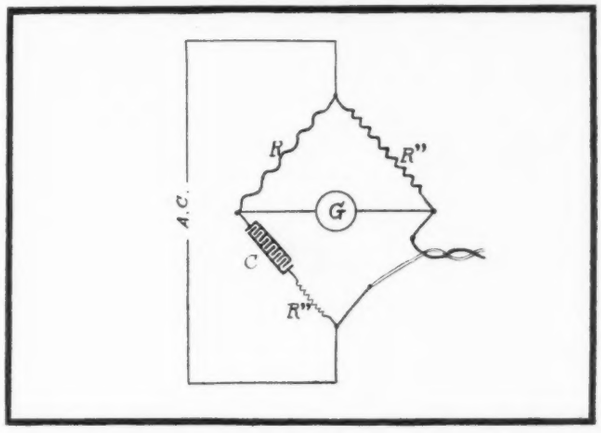


Fig. 2. Diagram of Connections for Measuring Electrostatic Capacity.

and *R''* until the galvanometer ceased to vibrate. *R''* does not enter into the calculation of capacity which is represented by the formula $\frac{R}{R'} C$. Therefore, as *R'* and *C* were constant, the relative capacities are proportioned to *R*, and as we deal here entirely with relative values the figures given for the different tests are the *R* resistances required to give zero vibration to the galvanometer.

Before proceeding to the derivation of formulas, it is important to remember that the theory of relative capacities with different connections in bunched or paired telegraph or telephone cables is extremely complex. The formulas here given are not absolutely correct, on account of certain very small capacity effects that are ignored for the sake of simplicity. They are probably close enough, however, because it is impossible to make cables of this sort and not have in the capacities of different wires variations of as much as five or ten per cent, which would be sufficient to cause great discrepancies, even if theoretically correct formulas were employed.

We shall first consider the simplest case, namely, that where adjacent wires in a telegraph cable are transposed, and after that we shall give general directions which are applicable to almost any condition of single transposition.

Fig. 3 represents a number of wires in a layer of telegraph cable. *A* and *B* are the two wires which are transposed at a distance of *X* feet from the end where the test is applied and *Y* feet from the other end of the cable. In representing a test between two wires the letters designating each will be coupled together thus: The capacity between *A* and *B* will be spoken of as capacity *A B*.

The general plan of procedure is to determine the capacity between adjacent wires and also the capacity between wires *C* and *E*, the latter being selected so that the number of wires between *C* and *E* is equal to the number between *C* and *B*, or between *C'* and *A*.

If the capacities between *C* and *A*, and between *C* and *B*, are then measured we can derive a formula which will give the approximate distance to the fault. In order to get good

*Abstract of a paper presented at a meeting of the Pittsburg Section of the American Institute of Electrical Engineers, and published in the September *Proceedings* of the Institute.

average results it is advisable to make a number of measurements of similarly placed wires as is hereafter shown. The

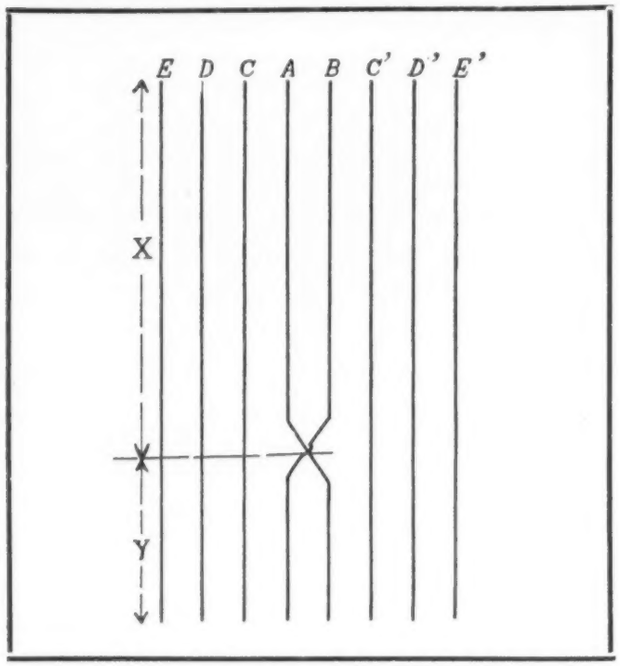


Fig. 3. Diagram Illustrating Method of Figuring Capacity.

first thing to do is to determine the relative capacity values of the following combinations of wires— $A\ B$, $C\ E$, $C'\ E'$, $C\ A$, $C'\ B$, $C\ B$, $C'\ A$.

Let capacity $A\ B = a$ (1)

Let capacity $\dfrac{C\ E + C'\ E'}{2} = b$ (2)

Let capacity $\dfrac{C\ A + C'\ B}{2} = c$ (3)

Let capacity $\dfrac{C\ B + C'\ A}{2} = d$ (4)

Let L = the total length of the cable.

The capacity per foot of (1) $= \dfrac{a}{L}$ (5)

The capacity per foot of (2) $= \dfrac{b}{L}$ (6)

From which we get

$$\frac{a}{L}x + \frac{b}{L}y = C \quad (7)$$

$$\frac{a}{L}y + \frac{b}{L}x = d \quad (8)$$

Solving equations (7) and (8) for x we have

x = the distance to the fault

$$= \frac{a\ c - b\ d}{(a-b)\ (a+b)} \times L \quad (9)$$

Now as $x + y = L$, we can substitute $y = L-x$ in equations (7) and (8) and get the following results—

$$x = \frac{c-b}{a-b} \times L \quad (10) \text{ from equation (7)}$$

$$x = \frac{a-d}{a-b} \times L \quad (11) \text{ from equation (8)}$$

Equation (9) is the proper one to use because equations (10) and (11) do not generally give concordant distances, although their average is usually near the distance obtained by equation (9).

After a consideration of the explanation presented in working out formulas as applied to the location of transpositions in telegraph cables, it will be seen that the same general methods may be employed in locating split pairs in telephone cables, provided we can make the capacity b fairly uniform throughout the cable, and then either measure it directly or else eliminate it from equation (9). The first can be accomplished fairly well by grounding all the wires in the cable except those used in the test, and b can be eliminated from equation (9), as will now be shown.

Referring to Fig. 1, A, A', A'' and A''' represent four good pairs. C, D, E, and F represent the split pairs, C and F being connected correctly, D and E being cross-connected. The capacity between the wires of the individual pairs A, A', A'' and A''' should first be measured and the average taken as the value of a. It is not absolutely necessary to take just four pairs, but enough should be measured to insure a good average result.

As in the case of telegraph cables, we will let the capacity

$$\frac{C\ D + E\ F}{2} = c \text{ and } \frac{C\ E + F\ D}{2} = d.$$

Now by referring to Fig. 1 we can say that the capacity b is equal to the capacity $C\ E$ throughout the distance x added to the capacity $C\ D$ throughout the distance y. Now as a is the capacity of a pair we can say that a equals the capacity $C\ D$ throughout the distance x added to the capacity $C\ E$ throughout the distance y. This gives the relation $b = c + d - a$.

Test between wires	Fault No. 1	Fault No. 2	Fault No. 3	Fault No. 4	Fault No. 5		Fault No. 6	
	Relative Capacities = R in Fig. 2.							
	m	m	m	m	m	n	m	n
A	555	523	527	554	827	827	827.5	826.5
A'	537	530.5	540	576	832.5	833	839	838
A''	538	519.0	618	589	837	838.5	848.5	846
A'''	536	547.5	592	566	830	830	831.0	829.5
Average a	541.5	530	569	571.2	831.6	832.1	836.5	835
$C\ D$	505	472	466	478	681	710	762.5	770
$E\ F$	468	485	504	498	686.5	716	766	773.5
Average c	486.5	478.5	485	488	683.7	713	764.3	771.8
$C\ E$	497	469	469	479	756.5	764.5	679.5	714.5
$E\ D$	466	480.5	490	492	747.5	756.5	674.5	707.5
Average d	481.5	474.8	479.5	485.5	752	760.5	677	711

m indicates that other wires in cable were free and not grounded.
n indicates that other wires in cable were all grounded.

Table a. Results of Experimental Tests and Computations.

No. of fault	Length of cable	Actual distance to fault	Calculated distance to fault: Other wires not grounded	Calculated distance to fault: Other wires grounded	Average error in feet: Other wires not grounded	Average error in feet: Other wires grounded
No. 1	586 ft.	293 ft.	305.6	——	+12.6 ft.	——
No. 2	586 ft.	293 ft.	303.1	——	+10.1 ft.	——
No. 3	586 ft.	293 ft.	302.3	——	+ 9.3 ft.	——
No. 4	586 ft.	293 ft.	297.3	——	+ 4.3 ft.	——
No. 5.	1155 ft.	433 ft.	404	433.7	—29. ft.	0.7 ft.
No. 6	1155 ft.	759 ft.	797	765	+38. ft.	6.0 ft.

Table b. Showing Errors in Feet in Experimental Tests.

Substituting this value of b in equation (9) we get

$$x = \frac{(a-d)\ L}{2a-(c+d)} \quad (12)$$

Which is the formula to use for a split pair in a telephone cable.

Referring now to Tables a and b, faults No. 1, No. 2, No. 3, No. 4 were purposely made in 585 ft. of 203-pair No. 19 cable.

There were two, three, four, and five pairs respectively between the faulty pairs of each fault. It is evident that the farther the faulty pairs are apart the nearer correct is the fault location. Tests were not made in this case with all the wires except the test wires connected to the lead sheath, or else a less error in feet would probably have been obtained. Faults 5 and 6 were in the No. 13 pairs of a combination cable consisting of 15 pairs No. 19 and 10 pairs No. 13.

It is a notable fact that the error in feet is much smaller when all the wires not used in each test were connected to the lead cover than when all wires were free.

Some tests were made using a ballistic galvanometer and the discharge deflection method and good results were obtained. This method would probably be used the most in practice, but there are testing sets where the resistance method and a telephone are used; these are especially suitable for locating faults of the kind herein treated. One of these, designed by the writer, is giving good satisfaction in commercial use.

Conclusions. Sufficient tests are not here given to enable anyone to tell how successfully such faults could be located in practice, but the writer is of the opinion that relatively better results might be obtained, because the general average of many sections of cable would tend towards capacity uniformity, especially in telephone cables. The tests on telephone cables here recorded average better than those on telegraph cables. The methods would probably have a wider range of usefulness in telephonic than in telegraphic engineering work.

The Preservative Treatment of Loblolly Pine Cross-Arms*

By W. F. Sherfesee

Chief, Office of Wood Preservation, U. S. Forest Service.

The preliminary bath of live steam, which is commonly applied in the treating plants of this country, is undesirable from several points of view. It is expensive; it adds from three to six hours to the length of the treatment; and, unless carefully controlled, there is serious danger of its detracting from the strength of the timber. There is also reason to believe that the seasoning it promotes, even in green timber, has been greatly overrated. In the case of seasoned and partially seasoned loblolly pine, experiments showed that the steam bath uniformly increased the moisture content of the wood. The following is one of a number of experiments which were made to test this point:

Ten 5-foot cross-arms were selected, each containing about 0.45 cubic foot. Three species of southern pine were represented—longleaf, shortleaf, and loblolly. The longleaf and loblolly arms were made up of both green and seasoned timber. All the arms were weighed immediately before treatment and placed in an experimental cylinder so arranged that all factors in the treatment could be carefully controlled. Live steam was then turned on and maintained for three hours at 20 pounds pressure. To assist in raising the temperature within the cylinder, steam was circulated through the heating coils arranged along the bottom. At the end of the steam bath the arms were quickly withdrawn and reweighed. The results are shown in Table 5.

Kind of timber.	Grade.	Moisture condition.	Weight before steaming. Lbs.	Weight after steaming. Lbs.	Gain per arm. Lbs.	Gain per cubic ft. Lbs.
Loblolly	Sap	Seasoned	20.0	22.5	2.5	5.5
"	"	"	15.5	18.0	2.5	5.5
"	"	"	18.0	20.0	2.0	4.4
"	Heart	"	18.5	19.0	.5	1.1
Longleaf	"	"	18.0	19.5	1.5	3.3
Shortleaf	"	"	21.5	23.0	1.5	3.3
Longleaf	Intermediate	"	20.5	22.0	1.5	3.3
"	"	Green	29.5	31.0	1.5	3.3
Loblolly	Heart	"	26.0	28.0	2.0	4.4
"	Sap	"	23.0	24.5	1.5	3.3

Table 5. The Effect of Live Steam upon the Moisture Content of Pine Cross Arms.

In every case the steam bath increased the moisture content of the wood. This was true in the green arms as well as in those which had been seasoned to an approximately air-dry condition. The strength of partially seasoned timber is decreased up to a certain point in proportion to the increase of the moisture content. As creosote retards the evaporation as well as the absorption of water, the original strength of the arms is not regained for long periods.

The principal benefit of the steam bath, at least with such species as loblolly pine, seems to consist in the thorough warming and expansion of the wood structure. The poor heat conductivity of wood, however, renders it doubtful whether more than the outer layers can be affected by steaming at safe temperatures and for ordinary lengths of time.

Moreover, the added moisture in the wood fibers tends to retard the absorption of the creosote. Probably the same objection can not be raised if aqueous solutions are used as preservatives, but with oils it is important that the fibers should be as nearly dry as possible. This view was substantiated by the result of the experimental treatments, which showed that the penetration in the steamed arms did not average as high as in the arms which had not been steamed. The durations of the steam baths varied from one to ten hours at 20 pounds pressure. The results were comparatively uniform, and showed little additional effect from the longer steaming periods. The above observations, however, do not necessarily apply to a wood of extremely resinous content, such as longleaf pine "fatwood." The effect of steam on such woods involves wholly different considerations.

It was also found that the preliminary vacuum could be abandoned without appreciably affecting the ease with which the timber absorbed the preservative. For timber as porous as air-dry loblolly pine the three or four hours which are usually required for the vacuum can be saved, with a considerable reduction in the expense of the treatments. Indeed, it is probable that the effects of the vacuum as a preparatory process have also been overestimated. However, even in the case of air-dry pine, the vacuum is desirable as furnishing an effective means for quickly drawing the preservative from the storage tanks to the treating cylinder.

Up to this point the experimental treatments had shown (1) that cross-arms of air-dry sapwood loblolly pine will quickly become thoroughly saturated with warm creosote (at about 125° to 140° F.) without the application of pressure; (2) that to saturate the heartwood it is necessary

*Abstract from a circular of the U. S. Forest Service, concluded from issue of Sept. 12, 1908.

to apply pressure, and (3) that the steam bath and vacuum are unnecessary preparatory processes for the treatment.

A large saving in the time required for the treatment had been effected, but the more important point of bringing about an economy in the use of oil yet remained to be accomplished. This last object was fully attained by drawing a vacuum after the desired penetration had been secured.

During the process of seasoning most of the moisture in the cells and intercellular spaces in the wood is evaporated and is replaced by air. The preliminary vacuum, drawn only for a few minutes, chiefly for the purpose of filling the treating cylinder with the preservative, fails to reduce materially the amount of air in the wood structure. When the preservative enters the wood, either by its own penetrative power or by the application of pressure, it fails to replace entirely the air in the cells and intercellular spaces. If pressure is applied, the air becomes compressed, but can not all escape. When the oil is run out of the treating cylinder and a vacuum is applied the air in the wood structure not only tends to resume its original volume but by reason of the vacuum it exerts great expansive force, driving the superfluous oil out of the timber. This collects in the bottom of the treating tank, and after the vacuum has been continued for a sufficient period can be recovered by being blown back into the storage tanks.

Just as it is easier to penetrate sapwood than heartwood, the vacuum acts more sluggishly in the heartwood portions of the timber. Hence, although a greater amount of oil is forced into the sapwood, a proportionately greater amount is subsequently recovered, and the residue in the two different classes of wood tends to become fairly equal. By this method it is possible to continue the pressure until the heartwood has received the desired penetration without running the risk of leaving an unnecessary amount of oil in the more porous sapwood. The amount of oil that can be recovered by a final vacuum from pine timber is surprising. The treatments shown in Table 6 were made in the large commercial cylinders, 6 ft. in diameter and 96 ft. long. The amount of timber in a single load varied from 1200 to 1400 cu. ft.

Class.	Pressure.	Absorption per foot.	Length of vacuum at 23 in.	Oil recovered. Total.	Per cu. ft.
		Lbs.	Hrs.	Gals.	Lbs.
Sap	Force pumps not used	14.0	2	1,033	7.6
Intermediate	12 pounds for 12 minutes	13.6	2	875	6.6
Sap	Pressure applied for 18 minutes reaching a maximum of 16 pounds	16.0	1	1,130	8.0
Heart	Pressure applied for 35 minutes reaching a maximum of 70 pounds	15.0	1½	358	3.2
Intermediate	15 pounds for 4 minutes	15.0	½	600	5.1
Sap	Pumps worked for about 8 minutes, but no pressure registered	25.0	½	1,302	10.7
"	8 pounds for not more than 3 minutes	21.0	1	1,659	11.5

Table 6. The Effect of Drawing a Vacuum after Impregnation.

If the vacuum had been continued longer in all of the runs it is probable that even a greater amount of oil could have been extracted. The treated wood appeared dry on splitting. The cells contained little free oil, but the walls were thoroughly coated.

It is believed, therefore, that the method of drawing a vacuum after impregnation accomplishes the desired results. The heartwood, in most cases, received an absolute impregnation without the absorption of large quantities of oil. In some cases the penetration extended in the heartwood for about an inch and a half from the sides; the interior was not wholly discolored by the oil, but showed the presence of a small amount of creosote by dark spots and flecks appearing along the pores. Such a penetration is believed to be ample for timber of this character, where decay alone, and not mechanical abrasion, is to be guarded against.

The amount of oil that should be injected before drawing the vacuum depends almost wholly upon the relative amounts of heartwood and sapwood. If the timber is composed almost wholly of heartwood much less need be injected than if sapwood is present. The point of importance is not the amount of oil the timber is made to absorb, but to apply enough pressure to force the oil into the heartwood portions. Hence, if no heartwood is present little or no pressure need be applied.

The amount of oil left in the timber must depend upon whether it is composed of heartwood or sapwood and upon the individual opinion of the owner. Until more is known of the changes which creosote undergoes in wood exposed to the full force of the sun and wind, it is recommended that 10 lb. of oil per cubic foot be allowed to remain in the sap class of arms, 8 lb. in the intermediate class, and 6 lb. in the heart class. It may be perfectly safe to reduce the oil in all classes of timbers to about 6 or 8 lb. per cubic foot, or even lower. Certain of the most abundant constituents of creosote evaporate at summer temperature on exposure to the air: hence it is prudent to obtain creosotes which have the smallest proportion of volatile oils. It is very desirable that experiments should be undertaken to ascertain definitely what changes take place in treated wood. Preliminary analyses of treated sections of several years' exposure are suggestive, and indicate a need for more complete results.

EXPERIMENTS WITH GREEN TIMBER.

In the foregoing experiments the timber weighed 31.5 lb. per cross-arm, or between 34 and 35 lb. per cubic foot, and, if possible, the wood should always be allowed to reach this or a less weight before treatment. In order to test the impregnation of green wood, a few cross-arms of green loblolly pine were weighed and treated. An oil pressure of 20 lb. was applied for 15 minutes. The pressure was then increased to 40 lb. and held at that point for 15 minutes. The superfluous oil was then blown back into the storage tank, and a vacuum of about 25 in. was drawn for half an hour. The green timber showed an average gain of only 2.2 lb. per cubic foot as compared with 12.6 lb. in dry sapwood in the same load. But by splitting the green arms it was found that a good penetration had been received. The oil had penetrated into the wood for several inches from the ends and from the insulator pin holes, and even along the sides a fairly good penetration had been obtained. The color of the treated wood was much lighter than in the dry arms, on account of the large amount of water with which the preservative was mixed.

This experiment by no means indicates that seasoning is unnecessary. The comparative lack of strength of green timber, as well as its tendency to check and split, and so to expose the unprotected wood, make thorough air seasoning imperative. And it is not known what the effect of so large an amount of water upon the permanency of the creosote in the wood will be. That such thoroughly moistened fibers can become completely saturated with creosote is doubtful. The results are of value, however, in indicating that, when necessary because of an emergency, partially seasoned timber can be used.

THE SAVING BY THE PROCESS RECOMMENDED.

The adoption of the process recommended will effect a saving both in the amount of oil required for thorough impregnation of the timber and in the time of treatment. A saving of even 2 lb. of oil per cubic foot of timber in an ordinary commercial load of about 1400 cu. ft. means a very considerable reduction in the cost of treatment. In many cases a much greater quantity can be saved.

The omission of the steam bath brings about a decided saving in fuel; of considerably more importance is the saving in time. To treat a load of cross-arms in accordance with the specifications in common use requires from six to eight hours. Under the specification recommended in this report the time will be reduced to less than two hours, and when it is remembered that

the number of the quickly treated sapwood runs will greatly exceed that of the slower heartwood runs, it is evident that the average time of treatment can probably be still further reduced. The capacity of a plant, and therefore, to a lesser extent, its profits, depends primarily upon the daily number of runs.

PERMANENT BASIS FOR GRADES.

At the beginning of the study the basis for the heartwood and sapwood classes was chosen somewhat arbitrarily. It provided that all arms containing at least 75 per cent of heartwood should be separated into Class A and those with at least 75 per cent sapwood into Class B. Class C, or the intermediate arms, were to contain 75 per cent of neither heartwood nor sapwood. The results of the later treatments have proved this basis correct, and it is recommended that it be followed in commercial practice.

GRADING AT THE TREATING YARD.

When the carloads of arms for the experiments arrived at the treating plant they were unloaded and piled on the yard to season. The grading was done as the arms were unloaded from the car. A force of about six men was employed for each car. Each arm had to be marked individually with crayon, to be later restamped with iron stencils, and this necessarily delayed the unloading to a greater extent than would have been the case had it been necessary merely to grade the arms and not to mark them. Even with this handicap, however, the unloading was almost as quickly accomplished as in ordinary commercial practice without grading. It is important to note that even the unskilled labor employed in unloading and piling the arms soon became fairly expert in quickly deciding into which class each arm belonged, and it soon became sufficient merely to check the judgment of the laborers. The present commercial custom requires the present of an inspector at the unloading of each carload of lumber, in order to pass upon the soundness and other specified qualities of the timber. This in itself necessitates the individual examination of each arm as it is removed from the car; no additional time is required to indicate to the laborers in which of the three piles the particular arm is to be placed. The cost of grading, therefore, under most circumstances is negligible.

GRADING AT THE MILL.

If conditions make it advisable to avoid the grading at the treating yards—and under most circumstances this will probably be the case—an excellent plan is to have the arms graded at the mill and shipped to the treating yard in separate cars.

In many localities the cross-arm mill is located on the railroad, where shipping is comparatively quick and inexpensive. The actual felling of the timber is carried on within a wide radius of the surrounding country. The logs are hauled to small portable sawmills, which constantly follow the base of supply. There they are sawed into timber of rather rough dimensions, which is next carried on wagons to the cross-arm mill. The next step is to plane and edge the timber to the exact dimensions specified for the arms. The timber is then passed on to the boring machine, where the bolt, pin, and brace holes are bored, and finally the upper edges are rounded off and the arm is ready for shipment. During this process of manufacture each piece of timber is carefully examined by an inspector, who separates the arms into different grades—firsts, seconds, and culls.

To one as experienced in handling lumber as this inspector must necessarily be it is only the work of an instant to grade the arms into the additional classes, depending upon the relative amounts of heartwood and sapwood. His judgment can be indicated by a slight crayon mark. When the arm is finally removed from the finishing machine this mark will indicate into which car or in which pile the arm is to be placed. Then the graded arms are shipped to the treating mill in separate cars, and the work of the treating plant inspector, so far as the grading is concerned, is reduced merely to passing upon the judgment of the inspector at the mill. If the arms have reached an air-dry condition they can then be unloaded directly from the railroad cars to the cylinder buggies; otherwise they are piled in the yard to season.

SEASONING AT THE MILL.

Whether or not the arms should be seasoned at the treating yard or at the mill before shipment depends entirely upon local conditions. If convenient arrangements can be made at the mill, they should by all means be seasoned before shipment. This results in lessening the handling of the arms at the treating yard, and in considerably reducing the freight charges. A carload of green arms frequently weighs from 55,000 to 60,000 lb. A loss in weight of 40 per cent reduces this weight to not more than 36,000 lb., a saving of the freight charges on from 22,000 to 24,000 lb. of lumber. Even for comparatively short hauls this saving is decidedly more than sufficient to defray the slight extra cost of grading and seasoning. In most cases no extra expense is entailed in grading the arms; 50 cents per carload is believed to be a liberal average estimate. There is no extra cost to season the arms other than that entailed by one extra handling of the timber and by holding it for a comparatively few weeks. Often both these items of expense are already present because, even in the ordinary practice, arms will arrive at the treating plant more rapidly than they can be treated, and piling in the yard is necessary.

The results of the entire study are summarized in the following recommendations:

1. During the process of manufacturing the arms they should be graded into three classes: Arms that contain at least 75 per cent of heartwood; arms that contain at least 75 per cent of sapwood, and arms that occupy an intermediate position.

2. The arms should next be piled in the seasoning yard until they have approached an air-dry condition. The form of the pile should be 20 by 20, with the two end and middle arms turned with the wider sides vertical. In winter the piles should be covered with a roofing of plank to protect the arms from snow and rain. The seasoning yard should be so situated as to afford full access to the winds, and avenues at least 4 ft. wide should be left between the piles so as to allow currents of air to flow freely on all sides of the timber.

3. If it has been possible to season the timber at the mill, each class or grade should, when the arms have approached an air-dry condition, be loaded in separate cars and shipped to the treating plant, where they can be unloaded directly on the cylinder buggies. During this unloading the inspector will have a chance to check up the mill inspection and grading.

4. Each class of arms should be treated separately. The usual preliminary bath of live steam should be omitted. A vacuum should be applied only sufficient to draw the oil from the storage tanks into the treating cylinder. If the arms belong to the sapwood class, no pressure is necessary in most cases, but care should be taken to apply sufficient pressure, if necessary, to penetrate the heartwood portions of the arms. The exact amount of oil absorbed by the timber should be carefully noted. When the impregnation has been completed the surplus oil should be blown back into the storage tanks and a vacuum drawn in the treating cylinder. From time to time the oil which is forced out of the timber by the expansion of the air during the vacuum, and which collects in the bottom of the cylinder, is blown back into the storage tanks. The vacuum should be continued until only the desired amount of oil is left in the timber. It is recommended that the arms of Class A (heartwood) should finally contain about 6 lb. per cubic foot; the arms of Class C (intermediate) about 8 lb. per cubic foot, and the Class B arms (sapwood) about 10 lb. per cubic foot.

The cylinder doors are then opened, and the treatment is complete. The total length of the average treatment will probably fall considerably under two hours.

Subscribers' Station Records

By Geo. S. Houston

The method employed by one of the large Independent telephone companies for furnishing correct records to all its departments may be of interest to those whose system is not giving the satisfaction they would like.

This company maintains separate departments designated as follows:

Executive, operating, contract, installation, construction, engineering, auditing, bookkeeping, collection, trouble, directory, storekeeping.

All orders of every description, relating to telephones, must go from subscribers to the contract department, and come to other offices from the contract department. The various orders received by the contract department from the public, are as follows:

Installations	Disconnecting telephones
Take outs	Reconnecting telephones
Outside Moves	Extra name to be inserted in directory
Change in subscribers	Expunging extra name from directory
Change for directory	Change in rates of subscriber

The contract department has a printed blank covering each of these orders. When a subscriber gives an order, the blank is filled out and turned over to the installation department. Beginning the first of the year, every order given out by the contract department is given a serial work order number in order to identify it and a duplicate of that number is stamped after the subscriber's name in the copy of the office directory. The "Installation order" is made out from the contract signed by the new subscriber. The installation department holds all the orders received from the contract department during each day, and the first thing the following morning, makes a typewritten list of them under the various headings. This is called the "daily sheet." Twelve carbon copies of this report are made and have the date typewritten at the bottom. In order to typewrite this, it is necessary to write the list twice in order that the copies may be perfectly plain, making six copies at each writing.

Under the heading "Installations" are given the telephone number assigned to each new subscriber, his name, address, occupation or business (if a business telephone) as it is to appear in the directory, the rate he is to pay, and all information necessary to any department of the company, besides the work order number. Under each heading the names are arranged according to the numerical order of the telephone

Under "Take outs" are given the subscriber's telephone number, his name, address and the work order number.

Under the subdivision "Outside moves" are given the subscriber's telephone number, his name, his old address, his new address, and the work order number. If the subscriber is moving from one branch exchange territory to another, so that it is necessary to give him a new telephone number, his new number will also appear.

When one subscriber gives up his telephone and a new subscriber at the same address immediately orders it for himself, using the same number, it is shown under the heading "Change in subscriber." The telephone number, the old subscriber's name, the address, the new subscriber's name, his business (if a business telephone), his rate, and the work order number are given. A contract is taken from the new subscriber, which is filed in the contract department. The "change in subscriber" order is made from this contract.

If a subscriber's name has been misspelled, the wrong address given, or some other inaccuracy appears in the directory, the incorrect entry, the correct entry, and the work order number are given under the subdivision "Change for directory."

Subscribers leaving the city for a short time are allowed to have their residence telephones disconnected temporarily under certain conditions. The record under the title "Disconnect" shows the telephone number, the name of the subscriber, the address, the length of time to be disconnected and the work order number. If the subscriber returns to the city sooner than he had expected and before the length of time given in the "Disconnect" order has elapsed, it is necessary to make out a "Reconnect" order, giving the telephone number, the name, the address, and the serial number of the work order.

A subscriber often wishes to have his name appear in the directory under different headings. For instance, the subscriber might be the agent for a large company and want to appear in the directory under his own name and also under the name of the company he represents. Or, again, several non-subscribers in an office may want their names to appear in the directory under the telephone number of a subscriber in that office. Both of these varieties are classed as "Extra names" and the same charge made for each. Under the heading "Extra name," on the daily sheet appear the telephone number of the real subscriber, his name and address, and the name and business of the "Extra name" subscribers together with the work order number. When an extra name subscriber gives up his name in the directory, an "Expunge extra name" blank is made out, upon which appears the telephone number of the original subscriber, the name and address of the extra name subscriber, and the work order number.

Under the heading "Change in Rate" appear the telephone number, the name, the address, the old rate, the new rate and the reason for the change, of all subscribers whose rate has been changed.

This daily sheet is carefully checked with the original orders received by the installation department, which happens, in this case, to assemble and get out this daily sheet, but the work might be done by any other department just as appropriately. One copy of it is given to each of the following departments:

Executive, operating, contract, installation, construction, engineering, auditing, bookkeeping and collection, directory, storekeeping.

The original orders from the contract department are placed in numerical order and carefully bound each day, with the date stamped on the cover, and filed in the installation department for future reference in case of disputes. Each department receiving a copy of the daily sheet has binders and keeps on file in its offices all the sheets received since the beginning of the year.

Each day, the installation department looks over the sheet, and makes out orders to the men to install, take out, move, disconnect and reconnect all subscribers appearing on the sheet under those headings.

The copy sent to the manager's office is used for any purpose he may see fit. It keeps him familiar with everything happening, and he can see at a glance, each day, just the proportion of each kind of order.

The operating department and the chief operators at each of the branch exchanges use their sheets for correcting the card indexes and the switchboard plugs or symbols when the orders apply to that exchange. The branch wire chief corrects his records and terminal racks from the same sheet.

The contract department uses the sheet as a means of finding any order when the date of the order is known. When the work order number is known, the order can be easily found from the filed orders in the installation department, where they are kept in numerical order. If the name of the subscriber is known, the name is looked up in the office directory and the work order number is found following the name, and the work order is then looked up as above. The contract department

can quickly find any order if the telephone number is known, the date is known, the subscriber's name is known, or the work order number.

The copy sent to the construction department is also used by the engineering department for watching the shifting of the telephone center, and as a means of checking the amount of work done by the different construction crews.

The auditing department uses the daily sheet as a basis of making up the daily reports showing the earning power of the company, and for any other purpose necessary.

The copy sent to the bookkeeping department and also used by the collection department, is used by them for their authority for inserting a new page in their loose leaf ledger. The bookkeeping department obtains from the sheet under the heading "Installations" the name, business, address, address to which the bills are to be sent, the telephone number and the rate of each new subscriber. They correct the address, and the number when necessary, where there is an "Outside move" of "Change for directory." They close the subscriber's account when ordered to do so under the heading "Take out." They stop the rental or begin the rental of the subscriber according to whether he appears under the subdivision "Disconnect" or "Reconnect," and add or deduct the rental of the extra name subscriber according to whether he appears under the title "Extra name" or "Expunge extra name." They change the rate when ordered to do so by the "Change in rate" division.

The directory department adds a new subscriber's card under the subscriber's number, one under his address, and one or more under his business classification when told to do so by the name appearing under "Installations." It corrects its cards for subscribers appearing under "Change for directory," also when they appear under "Outside moves," "Change of subscriber" and "Extra name installed" or "Expunged."

The storekeeper keeps a check on the instruments given out to installers and returned by them. There should be no more net loss or net gain of instruments in the storeroom each day, then the net gain or net loss shown by the "Installations" and "Take outs" on the daily sheet.

All the information there is, concerning every order, is put on the daily sheet. Every department has *all* the orders issued every day, right in front of it and only has to pick out the orders applying to that department. In case of an error, the trouble is easily located, because the order is either on the sheet or it is not on the sheet. If it is not on the sheet, the error may be that of the installation department in getting up the sheet, or the contract department in making out the order. Each department has *all* the information belonging to the other departments, as well as its own, before it; for this reason many changes have been made from time to time by the heads of different departments, each simplifying or making more efficient the work of his own department without adding to that of some other department.

Some Dry Cell Pointers

By L. W. Carroll

Leclanche and other types of "wet" cells are nowadays almost never installed at telephone subscribers' stations where local battery instruments are required. Dry batteries have won preferment because they are not only cleaner to handle, but do not require the same amount of attention for maintenance that is needed to keep a wet cell in good condition. The improvement in the ability of the cells to sustain the required voltage and give sufficient current during a substantial life is a valuable result of the efforts exerted by the manufacturers to meet the needs of a rapidly expanding market.

The dry cell in a town subscriber's station is likely to last from five months to a year without any further attention after installing, and in the average farmer line subscriber's instrument the useful life ranges from seven to ten months, depending somewhat on whether the subscriber is prone to "rubber" or not. The actual life of the cell is somewhat dependent upon the local conditions of the installation and upon the condition of the cells when they are installed.

It is the usual practice to install two or three cells at each station, depending upon the transmitter used, and the service required, connecting them in series, zinc to carbon. As the zinc electrode forms the actual containing case for the contents of the cell the protecting paper cartons on the cells prevent the possibility of the zinc electrodes of two adjacent cells coming in contact with each other and causing a short circuit of one of the cells.

It may be easily imagined that, should this paper covering become saturated with moisture, one of the cells might become partially short-circuited through this moisture, causing a constant drain which would exhaust a cell in less than two weeks. This explains in a way the cause of the frequent renewals of the batteries at some subscribers' telephones which happen to be located in places where the amount of moisture in the air is high.

The writer finds that this trouble may be prevented by dipping the cells in hot paraffine wax before installing them, so that the paper cases are thoroughly saturated with the wax. This may be done at a cost not exceeding a quarter of a cent a cell, and will positively eliminate all trouble from partial short circuits due to dampness in the paper cases.

Considerable trouble is often caused by placing the cells in the telephone so that the binding posts on the zinc electrodes are so close that a slight jar brings them together, thus causing a dead short circuit and ruining one of the cells. A little care in placing the cells a short distance apart will often save an extra trip, as well as an extra cell for renewal.

There has always been some question as to when a dry cell has become useless, and the only reliable way is to test the cells with a battery tester, or small ammeter.

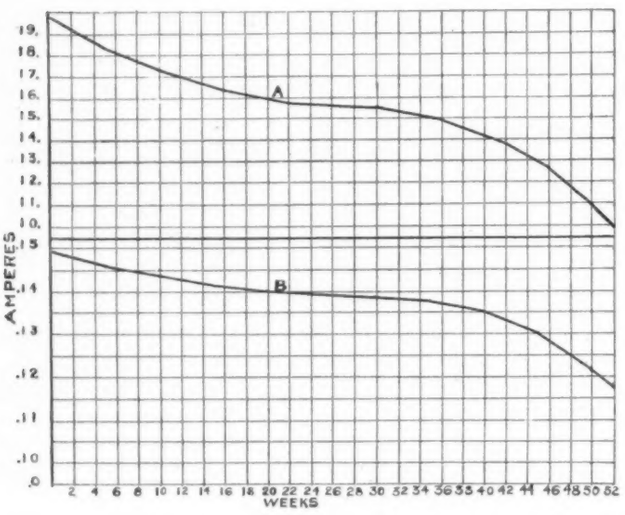
On an old cell, when the current will not hold up one tenth ampere through five ohms resistance for five minutes the cell may be considered of no further value for telephone purposes. The writer finds that fully 25 per cent of the cells taken from the substations, when afterward examined will give up to 0.15 ampere on this test, and that it is a good plan to bring discarded cells back to the central office, as there are many ways to dispose of these partially exhausted cells.

First they may be used quite efficiently in pole changers for ringing, as the cells in a pole changer battery may be run considerably lower than for any other purpose, because the internal resistance is not so important as when they are used as transmitter batteries. It is the writer's experience that cells which will give only one-tenth ampere on the test above mentioned will give very good service in a pole changer. Many of these batteries may be sold for use on door bells and similar uses where the current requirements are not large, and no trouble will be experienced in realizing at least five cents apiece for such of these partially used batteries as can be sold.

A fact which the writer believes is not generally understood is that new cells show a rapid falling off in their current capacity for the first few months after being manufactured. The curves shown in the illustration on the following page illustrate the loss in efficiency of new cells placed on the shelf for a period extending over a year.

These curves were plotted from averaged tests made on several types of cells now on the market. It may be added that there is a large discrepancy in the results of tests made on the different makes, as some cells show 10 per cent loss in current in six months, while others show a loss of 30 per cent in the same time. This loss is partly due to evaporation or drying out of the electrolyte in the cell and partly to local action caused by impurities in the zinc, etc.

Curve *A* shows the results of tests made by short-circuiting



Curves Showing Loss in Efficiency of New Cells Standing on Shelf not in Use.

the cells through an ammeter once a week, while curve *B* was plotted from tests made once a week on the same cells with an ammeter in series with ten ohms resistance. This resistance was selected as approximating the conditions of actual practice.

It will be noticed that a smaller percentage of loss is shown in curve *B* than in curve *A*. This is due to the fact that the internal resistance of the battery is the controlling factor in curve *A*, while in curve *B*, owing to the comparatively high external resistance in circuit, the internal resistance has little effect on the current. It is for this reason that the loss due to the increase of internal resistance caused by the evaporation of the electrolyte is not so noticeable in curve *B* as in curve *A*.

It seems reasonable to believe that the loss which occurs in idle cells is also present in cells which are installed in a subscriber's instrument, and therefore a cell which shows a small loss in efficiency when not in use for ten or twelve months is without doubt a good battery for telephone purposes. Where the work is heavy and the batteries are exhausted in a few months, there are batteries which will give better service than the one showing ability to retain its power during long storage, but this small gain in efficiency does not warrant the extra trouble involved in keeping several different types of batteries in stock.

It is for the above reasons that the consumer should test a certain per cent of all dry cells as soon as received from the manufacturer, to see that they are fresh. The curves presented show why it is not a good plan to carry too large a stock of dry batteries on hand.

In order to eliminate as much as possible the loss of efficiency of dry batteries held in stock, arrangements may be made with the manufacturer for the supply of batteries for a certain period to be shipped in lots of a specified number of barrels fresh from the factory at intervals as needed.

The manufacturer or jobber is always glad to make such arrangements as this and is usually willing to grant a discount from the regular price in order to secure a year's business. Small companies in adjacent territory can sometimes combine their purchases to advantage, on these terms.

The Operator

By H. E. Davis

In dealing with this subject it is not intended to dwell to any extent on any set of operating rules, as a set of these rules can usually be obtained from any of the larger companies; but the purpose is rather to talk of the operator as an individual, and methods of helping her to do the best work.

The words, "Telephone Operator" or "Central," suggests to the average subscriber only a girl who is a part of the machinery which it takes to run the exchange with which his line is connected. Very few subscribers know anything of the worry and patience required to drill a girl to the point of efficiency where she is capable of giving them reasonably good service. But to those people who have the training of this same girl in hand, the word means more. It means a product of patience, perseverance, study, watchfulness, firmness and, most of all, energy. And it is unnecessary to say where these qualities are found. Ask either party—the trainer, or the operator—who has been through it, and the answer will come quickly.

The training of an operator is by no means a small undertaking, for the problems of operation are many and varied, and any one having a certain number of girls to develop into competent operators has by no means an easy task. In the first place, he must have a great amount of patience, as a person without this qualification has poor prospects of ever making a successful operating force. In the second place he needs to have a large amount of perseverance in store, because without perseverance he cannot expect to succeed, for the simple reason that no operating force was ever built up in a week or so.

He must not only know when work is well done, but must study his operators to learn their different dispositions and temperaments, for without the ability to interpret and utilize their individual characteristics many good operators would be lost. And with this insight into personalities must go the study of their board loads, so that they may put the right operators in the right place at the right time. Above all is watchfulness required so that the chief may be able to forestall or handle any of the numerous little emergencies which are liable to arise daily.

In dealing with operators one has to be firm, and operators soon come to understand that firmness is one of the chief's qualifications. There are all classes of operators, and each class needs a little different handling. There can be no set rule for dealing with operators individually, as the method of handling one operator would not produce the same results with another.

There is a habit prevalent in some of the smaller exchanges of crowding in as many operators as possible, regardless of expense or service. Probably in a large percentage of the smaller exchanges the cost can be cut down to the minimum by a proper study of board loads, and a more uniform grade of service given. Operators give better service when they are busy than they do when not well occupied. There is loss in efficiency rather than gain in carrying a full board of operators during the low day and evening loads. Fewer operators would

handle the business better, and give a more uniform load per operator. With proper team work, and an intelligent use of the intermediate frame, certain positions may be left idle at dull times during the day, resulting in a more economical operating schedule.

Operators given control of the board by themselves, without supervision, no matter how good they may be, will ruin the service. They must have at all times careful supervision. It has been the habit of some operating people to ascribe part of their operating troubles to the equipment. This is only an excuse, and a shifting of faults to the shoulders of another There is only one way to remedy the evil in an operating system, and that is to eliminate that part of the operating force which interferes with the service, no matter what it may be.

After the operator has been assigned to a position she will bear very careful watching, as she has a feeling that she is responsible for the complaints which originate from subscribers on her position. Consequently she will try to cover up mistakes. Without the proper supervision she will probably succeed in doing this, to the detriment of the service. Up to the time of assignment to a position her disposition may have been nearly an unknown quantity, but from this time on it will become more apparent as she continues in the service, and so the proper training of her disposition is an important factor in operating room management. She cannot be too carefully watched, with the purpose of making mental notes of her disposition, and any other peculiarities which she may have, so that at some future time knowledge of them may be made useful. She should be especially trained in discipline, methods of handling calls, equipment and team work. These three items, well trained into a set of operators, will materially improve the results obtained in the department. Every operating official knows the value of a good operator, and the work required to train her to a high point of efficiency. There are some little violations of the operating rules which can be overlooked, but they should gradually become less, as the length of time the operator has been with the company increases. There are some rules which should be strictly enforced, and no excuses taken for any deviation. Among the most important are the rules pertaining to the handling of calls, conversation with subscribers, listening to conversations, looking around when visitors enter the room, quietness in handling cords, and refraining from loud talking. The operator should know, when she is assigned a regular position, just what is expected of her, and what she is supposed not to do. She should be made to understand that a good record means an additional value to herself, and to the company, which will result in a better chance of promotion and an advance in wages.

Efficiency, in a well governed operating room, is the basis on which better hours are assigned to operators, and each girl benefitted in this way is made to understand that the reason she was advanced was because she was more useful and had a better record than those who were not advanced to the position. The lesson that any violation of the operating rules tends to reduce her chances for promotion is readily acquired through observation and experience. If a new comer can be made to understand these conditions at an early period she will not be as bothersome as one who does not understand them. At times one will be found who does not seem to be able to understand these conditions, and she is generally the operator who causes more worry than any of the others. She is only a detriment to the operating organization, and the sooner persons of this class are eliminated, the better.

Discipline cannot be brought up to too high a standard, for an operating room with good discipline means that half of the battle for high-grade service is won.

The only reasons for which an operator should be allowed to look around from her work are to call the attention of the supervisor, or to see the time of day. Even these features can generally be eliminated by the installation of equipment for automatically signaling the supervisor and all clocks can usually be placed so that no operator will not have to look around.

Not only should every operator be cautioned about being quiet in the building, and especially in the operating room, but she should be taught just how to avoid noise. In taking down connections she will make a practice not to drop the plugs until she has them very close to their sockets, and she soon learns that rough handling of equipment will not be tolerated under any circumstances.

Neatness of her person and dress are two very essential points, as untidiness is no more to be allowed than noise. Never under any circumstances should an operator be allowed to chew gum or any other substance while on duty. Team work is a subject for constant drill, and responsibility for service on her team position is to be urged at every opportunity. Probably in many small exchanges chief operators and supervisors find this one of the most difficult problems which they have to handle. In many exchanges the old method was to let the operator take care of the position assigned to her. This she did and did well, and she soon had the idea that she was to answer calls appearing on her own board, and none other, and took it as an insult if any other operator handled a call at her position. With this class of operators it is indeed a problem to get any kind of team work, as the old practice and feeling are hard to eliminate and require a great deal of patience before the best results are obtained.

Probably much poor service has been given in many of the smaller exchanges by practically allowing operators the choice of their hours. The taking of an operator's personal convenience too much into consideration will generally cause poor service, or poor discipline. Operators may be given to understand when they are hired that the company regulates all hours, and hours assigned to them are only settled upon because they agree with service conditions. If they are trained along this line there is very little difficulty experienced when one wishes to change the operators' hours of duty. This condition is more apparent in the smaller exchanges than in those of the medium size, for the smaller the exchange the closer together personally are the operators and their superiors.

Reprimands are properly only given in such a way as to produce the impression that what is being told the operator at fault is a benefit to herself as well as to the company. If she can be made to feel that the chief operator is her friend instead of her enemy, the chances are that she will do much more satisfactory work. A good rule to follow with operators on the first offense is to show where the mistake has been made, and that the chief believes she did not understand the rule clearly, but that the next time she is reprimanded for the same offense an explanation of the reason why it was committed must be made, and that no excuse will be taken. Many are careful not to come back a second time on the same offense.

Operators are hard to get results from at times, and often their conduct will sorely try the patience of the best people, but one good operator is worth all the effort it has taken to train her. If one is fairly sure that a certain girl has possibilities of becoming a first-class operator, some of the infractions of the operating rules might be overlooked, but by each successive reprimand she should be impressed that the lines are being drawn closer. If she will stand the strain she will make the very best kind of an operator, and that is the only class which is wanted. There are plenty of fair operators, but the first-class operator is the one we are after, and she is very hard to obtain. The chief will have to develop her, for she will not do it herself, and furthermore, we all know that it takes a long time to make a finished operator. But she is worth every effort that it takes to train her to the point where she has attained the highest standard of efficiency.

Horses in Telephone Circuits

Small, compactly built telephone sets are extensively used by the United States army in the field and in camp. The equipment, operation and maintenance of the telephone and telegraph lines are in charge of the signal corps. The men in charge of the lines are mounted and are equipped with breast reels and cavalry buzzers. With these latest developments in the way of equipment most satisfactory results have been obtained, and, as the experiments of Capt. A. C. Knowles at Ft. Leavenworth have shown, it is even possible for two mounted officers to carry on a conversation over a single wire.

The buzzer is a combination of the telegraph and telephone, and is especially valuble, due to its ability to maintain communication over hastily built, poorly insulated lines, over which the ordinary Morse telegraph or the commercial telephone set would fail.

It is compactly packed in two small leather cases attached to one strap, by which it can be conveniently carried over the shoulder like a field glass. One of the leather cases contains all the buzzer apparatus, dry batteries, etc., while the smaller case contains all the telephone. The telephone transmitter and receiver are mounted on an adjustable frame, so that they can be carried in the smallest possible space, and both used with one hand. The telephone is connected to the buzzer by the insertion of a plug in the latter through a hole in the leather case. A switch in the adjustable frame must be pressed when it is desired to use the telephone set for conversation. To open communication, using either the buzzer telegraph or ordinary telephone conversation, one binding post is connected to the line wire and the other to the earth.

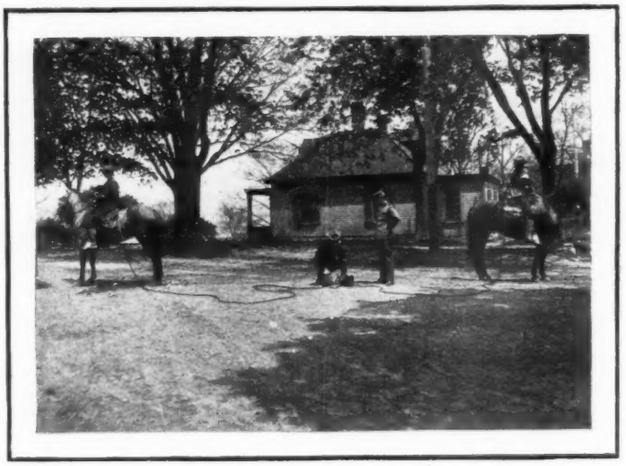
The buzzer wire issued with this instrument, consisting of three small wires twisted together and covered by a partial insulation, is wound on spools and also breast reels containing one-half mile lengths, weighing five pounds. These spools fit into a handle conveniently carried by a mounted man, and which permit the wire to be paid out on the ground as the man moves along.

Formerly when a mounted operator wished to communicate with the base station from which he was sent out, it was necessary for him to dismount and establish his own station by connecting his buzzer to the wire which he was reeling out, and to complete the circuit by driving a metallic pin into the ground.

It is therefore seen that although the rider could communicate at pleasure with the base at any time by dismounting and cutting in, yet on the other hand, the base had no means of notifying the rider that communication was desired with him until the latter chose to cut in.

A system which would permit inter-communication between the base and mounted operator or between two mounted operators at all times, whether at a halt or in movement, without the necessity of dismounting and establishing station, is what has been devised by Capt. Knowles. Now, when a mounted operator is sent out from a column for the purpose of accompanying a reconnoitering patrol, a flanking detachment, or any body of troops whose duty will take them far enough from the column to make electrical communication both practical and desirable, constant electrical connection may be had with them. It is no longer necessary for a man to dismount and cut in his instrument, for he may be called at any time, even while moving. He is ready to transmit messages to the base whenever necessary, and he doesn't have to stop to do it. The commanding officer of the body to which the operator is attached may ride alongside of his moving telegraph office and receive the message word by word as the operator receives it; or he may dictate his own message to the base in a similar manner. Should he desire to communicate by telephone, the operator hands him the combined receiver and transmitter, and without dismounting he may talk with the base.

The only way to accomplish this result is to ground through the horse. This is done by placing a small piece of copper, properly connected to the instrument, against the animal's body, and as the horse always has one or more feet on the ground while moving at any gait, except possibly the gallop, which would seldom be resorted to,



Telephoning from Horseback, One Side of Circuit being Grounded Through the Horse.

it is seen that the ground connection is completed through one or more hoofs. Of the several horses used in these experiments, only a few showed any discomfiture, and those that were affected by the current were soon quieted. They appeared to exhibit surprise rather than pain at something unusual, to which they quickly became accustomed.

These tests were made over all kinds of ground—very wet, muddy, moist, perfectly dry and dusty roads and fields, with results of practical value.

With two mounted operators similarly equipped, and separated by five miles of wire, conversation was carried on without difficulty, the horses standing in grass. The buzzer was loud enough to be heard several feet from the instrument.

After various tests it is safely asserted that this arrangement will not only work as efficiently as that where the rider dismounts to ground his circuit, but also saves a great deal of time, doing away entirely with all the preliminaries incident to station establishment before conversation is possible.

For particulars of this interesting use of telephone acknowledgement is made to The Journal of the U. S. Cavalry Association, in which appeared the first published description of the plan.

Saskatchewan's New Telephone Policy and Construction Projects.

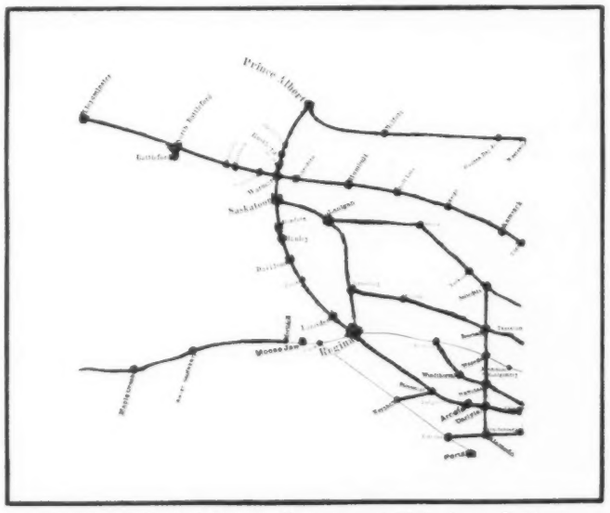
About two months ago a department of the Saskatchewan Government, known as the Provincial Department of Railways, Telegraphs and Telephones, was organized. As recently announced in our columns, the new department has let contracts for the construction of over 400 miles of long distance lines and has other lines under consideration.

The accompanying plan shows the lines to be constructed, the thick lines representing the proposed government system. The contracts for the sections from Saskatoon to Regina and from Regina to Antler have been placed. The thin lines represent the present toll lines, connections of the Bell Telephone Company of Canada and the Saskatchewan Telephone Company. The last named is the Independent company and it owns and operates lines west of Regina and southeast of Postal.

It is understood that for the purpose of raising money to finance its telephone scheme the Saskatchewan Government will issue forty-year debentures, bearing interest at four per cent.

Saskatchewan's new telephone policy is rather unique, and gives the government control over every telephone system that may hereafter be constructed, or acquired by the department. The telephone systems are divided into three sections, viz., long-distance or trunk lines, municipal lines and rural lines. The policy of the government, as laid down by the Telephone Bill makes the building of long-distance lines a provincial undertaking chargeable to the Province as a whole. It makes the matter of municipal telephone systems a municipal undertaking, chargeable to and controlled by the municipality. It makes the matter of rural telephone systems a rural undertaking chargeable to those who desire to unite as communities to secure the benefit of the telephone, managed and controlled by them, assisted by the government by a free grant of poles, which represent sixty per cent of the cost of construction.

The money to erect long-distance lines will be provided by the issue of provincial debentures; that for the municipal



Proposed Saskatchewan Government Telephone System.

system by municipal debentures and for the rural systems by the organization of joint stock companies, assisted by the government. The long-distance, municipal and rural systems are to be inaugurated into a united provincial system by provision in the bill for compulsory connection of all systems upon an equitable basis.

Rural telephone companies are given power to enter into agreements for the interchange of service with any other telephone company, the Commissioner being empowered to enforce an agreement, if necessary.

The books and accounts of all rural companies are subject to the inspection of the Commissioner, or his agents. Said books and accounts to be closed and balanced on the 31st of December in each year, and in case, after providing for all outstanding liabilities there remains a balance of cash on hand, the company may declare a dividend not exceeding eight per cent on the paid-up capital. Any surplus remaining after the payment of such dividend shall be employed in enlarging, extending or adding to the company's system.

No company except as provided for by the act shall be organized, incorporated or registered under the laws of the Province of Saskatchewan. And all companies organized under the provisions of the act shall be exempt from all assessments, rates or taxes.

The Telephone Bill also sets out that five or more persons desiring to construct, maintain and operate a telephone system for their mutual benefit, may present a petition to the commissioner of the new department, praying for the organization of a company for this purpose. Each petition is to be accompanied by plans, and estimate of the proposed system, and a schedule of rates, rentals or tolls which is proposed to be charged for telephone service. Should the Commissioner approve of the formation of the proposed company, he shall take the necessary steps to organize it under the Companies Ordinance, and shall not exact any fees for organization from such company.

The capital of any one company shall not exceed $150 per pole mile of the line to be constructed by the company, but with the consent of the Commissioner, the capital may be increased from time to time for the purpose of enabling the company to add to, enlarge or extend its system. The capital shall be divided into equal shares of $25 each, and 20 is the maximum number a subscriber can hold. Before construction is begun, the company must have paid up an amount equal to $20 a share. A rural company cannot refuse admission to anyone desiring to join and install an instrument, provided such person lives in the community where the company operates, and that such connection does not exceed a cost of $50.

The bill was drawn up by Francis Dagger, Provincial Telephone Expert, employed to assist Premier Scott and his associates in their attempt to devise an absolutely satisfactory solution of the complicated telephone problem of the Province.

The Rural Telephone and the Grain Market.

The advantages of the rural telephone in a grain country are well set forth in the following item which recently appeared in a Kansas newspaper:

"It's not often that farmers come into town now-a-days before they know exactly what they are to have for their load of produce," remarked a grain buyer a couple of days ago after he had hailed a farmer with a wagon load of corn from last year's crop, "but they know exactly what they will get when they leave home. That man had his load sold, and that is the reason I did not get the load. It used to be that every grain firm doing business or every elevator firm had what they called street buyers. That is, they would have men hanging around the street and watching for grain wagons coming in from the country in order to get them first before any one else and buy their load. These men were paid a commission for their work and as long as the season lasted they made pretty fair wages. It used to be that farmers would come into town and stand around all day, maybe, waiting for the highest bidder on their load and if they happened to get in when the demand was good they would get the bids, unless the grain buyers had cliqued against them and then they would wait till well along in the afternoon in the hopes that they would get a better bid that never came and would finally sell at the same price that was offered in the forenoon when they came in.

"It is different now. The rural telephones and rural mail routes have put the street grain broker out of business completely. There is nothing left for him. Before the

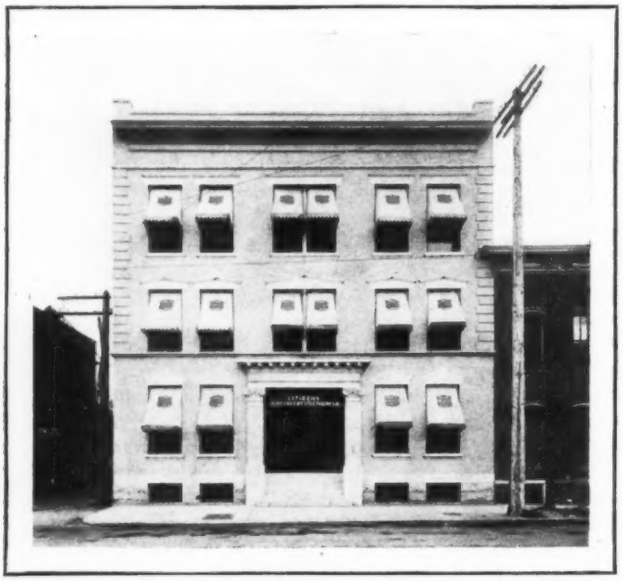
farmer leaves home with his load in the morning he finds out from the rural route that he can get so much for his produce, be it corn, wheat, oats or hay, or even butter and eggs. And if the price suits him he will contract for it before he starts to market and all he does is to haul it direct to where he has promised it, and he need not fear that he is getting less than paid by other buyers for the reason that he knows by the daily markets brought to the door by the rural mail routes, and then he can keep in touch with all the markets by the rural telephones. It's not as it was a few years ago by any means."

Independent Methods and Progress at Terre Haute, Ind.

One of the rapidly advancing Independent companies of the Middle West is The Citizens' Independent Telephone Company, of Terre Haute, Ind.

The accompanying illustration shows the building occupied by the company. It is constructed of vitrified brick, steel and concrete and is practically fireproof, as only the floor surfaces and doors are of wood. Attention is directed to the prominent display of the "Shield" on the awnings. The operating room is located on the top floor of the building and contains one of the latest type common battery multiple switchboards having an ultimate capacity of 10,000 lines.

The four-position toll board is located on the second floor as are also the operators' retiring room, dining room, kitchen and locker rooms. The engineer's office and the executive offices of the Citizens Independent Company, the Wabash Valley Telephone Company of Paris, Ill., and the Kinloch-Bloomington Telephone Company of Bloomington, Ill., also occupy part of this floor. These three companies have in operation a total of 11,000 telephones.



Building of the Citizens' Independent Telephone Company, Terre Haute, Ind.

The front part of the first floor is occupied by the general offices, and a public pay station office. The rear part is given up to the terminal room, containing the power board, charging and ringing machines and the wire chief's desk.

The storage battery is located in the basement where there is also an emergency gas engine charging outfit. The hot water heating plant, vault for books and papers and a well equipped repair room occupy the remainder of the basement.

Two years ago the entire outside system was reconstructed and a large amount of underground conduit laid. Most of the lines are in these conduits and aerial cables, only five per cent being on aerial wires, all of which are copper, no iron wire being used in the plant.

Great care is taken to give the best of service and the increase of subscribers is an evidence that efforts of the company in this direction are producing the desired results. From 800 to 1,000 service tests are made each month and the operator's average answering time is 3½ seconds. At the time the service tests from subscribers stations are taken, an inspection of the wiring and instruments is made, and many defects are remedied before an interruption of service takes place, as a result of this inspection.

Since January, 1906, in the face of strong competition, the number of subscribers has been increased from 2,400 to 4,000.

A Word of Friendly Advice to Operators.

Let us give a word of friendly advice to the telephone girls—if they care to have it. They have their hardships which are not appreciated any too generally by the people whom they serve. They can make it easier for themselves and they can gain the good wishes of the subscribers by one simple thing: Let them make a resolution never to be other than good-natured.

It takes two to make a quarrel. No man, let him be as surly and bad-tempered as he will, can get into much of a passion or stay in it long if he has nothing to fight. The telephone operator who is invariably cheerful, polite and accommodating, quickly smoothes the ruffled feathers of the most testy subscriber.

A low voice, saith wisdom, is an excellent thing in a woman. That is as true now as when it was first written. Never to become strident, angry or high-pitched; never to be other than soft and pleasant and well modulated—these are the signs by which you may know the gentle-woman's voice. Such a voice disarms anger, repels insolence, makes the rough places of daily business smooth.

Let it be remembered that the telephone is nowadays the vestibule, so to speak, of practically all human activity, commercial or social. The whole world talks through the telephone. Men, women and children, saints and sinners, wise men and fools—mankind and his cousins—use the wires.

The operator at the switchboard with the receiver at her ear is the moderator, so to speak, of this heterogeneous multitude. She can keep it in order and in good temper, or she can permit it to become the dwelling place of unkindness and vexation of soul.

Let her soothe the crank, placate the professional grumbler, and ignore the bully.

Let her, in short, be just, as well as amiable, considerate as well as courteous. Thus shall she do society a service and help the world go round. So shall those who deal with her over the wire come to take their tone from hers, and finally laud her with that highest praise: "This operator at the switchboard is all right."

Isn't it worth an operator's while to cultivate cheerfulness and politeness so that a thousand hardened telephone users shall rise and call her blessed?

At least one large telephone company has had the above lines from the Chicago *Examiner* printed in attractive type on heavy paper, and asked every manager to post a copy in his operating room. There is much wisdom expressed in these few paragraphs.

New Form of Consolidation.

The Freeborn, Minn., correspondent of the Albert Lea *Tribune* has contributed the following:

"The telephone lines west of the village were consolidated by lightning during one of our recent storms and the switch had to be all taken apart, the fine wires being melted together."

Still another case where "consolidation" means nothing but "trouble"!

Telephone Law

Conducted by A. H. McMillan

Advantages of Incorporation.

We would like a little information in regard to the law on telephone companies and their organization. We are at present running a mutual telephone company here in Kansas, which is owned entirely by our members, who paid in $30 each, and bought all material and supplies, we constructed our own lines, and hire our own operator.

This system has been operated about 14 months, but it is now the desire of a majority of the parties who are interested in it to reorganize, with the power to do business as a company, and to either borrow money, or issue stock to secure means to furnish and rent telephones to certain parties who are either unable or unwilling to put in $30 and go in on a mutual basis. While we expect to run it as a mutual company as far as possible, we wish to take care of those who will not come in on a mutual basis, and at the same time leave them the privilege of making a change to the mutual basis if they desire to do so later. Would the securing of a charter place us as a company in a position to contract business and at the same time avoid individual liability for the debts of the company? If so, what steps would be necessary to secure the charter, and what would be the probable cost? If this plan will not fit the case at hand, what would you advise?

Any business in which so many people are interested is more readily and more safely conducted by a chartered company than under any other arrangement, even if every person served is a stockholder. Such a chartered company can do business as an individual. It is an artificial individual composed of its several stockholders. Each stockholder is liable for payment of the full amount of stock for which he subscribes, but beyond this is not liable for the debts of the company. The exemption of the stockholder from further liability is somewhat new in Kansas, but is now a part of the constitution.

To secure a charter, write to the Secretary of State, Topeka, Kan., asking for blank forms for charter and copy of the corporation laws of Kansas. If the officers of your organization have time and will give careful attention to the law and the blanks, they will be able to fill the blanks and to proceed according to law. It may be better, however, to employ a lawyer to attend to this, and thus avoid uncertainty and possible mistakes.

The fees for issuing and recording the charter are specified in the law, which will be sent by the Secretary of State. Their amount depends to some extent upon the amount of capital stock for which the company is incorporated.

It is usually wise to incorporate with capital sufficient to pay for the property which will belong to the corporation, and for such extensions and improvements as are to be made in the near future.

The size of the shares may be such as is most convenient or desirable for those who will take stock. In the case under consideration the present owners have paid, in cash, $30. It may be advisable to make the corporation shares each $30. Then, when the stock is issued the old shareholders can pay for their new stock by assigning their old shares to the new company and no money will have to pass. If an old shareholder desires to increase his holding he should, of course, be allowed to buy additional shares for cash. New stockholders will pay cash for whatever amount of stock they subscribe.

It is not necessary that the entire amount of stock authorized be subscribed at once, or that the amount subscribed be immediately paid in full. These are details which are usually left to the board of directors.

In ordinary corporations the voting power of the stockholders is in proportion to the number of shares owned. In some telephone and other companies, or societies, it has been deemed desirable to vary this rule by allowing each stockholder only one vote, without regard to the number of shares owned. Provision is made for such societies, consisting of 20 or more persons, in chapter 116 of the session laws of 1887. To make this provision effective it is necessary to so specify in the charter.

Every corporation has the same right as an individual to borrow money, if it can find a lender willing to take such security as it has to offer.

Applicability of Oklahoma Statutes to Existing Corporations.

What application has the new constitution of Oklahoma to a telephone company which was engaged in business with lawful authority previous to the adoption of the new constitution? Would such constitution invalidate in any way a charter or franchise previously granted?

Section 215 of Bunn's annotated constitution, which deals with public service corporations, says, "No railroad, transportation, transmission, or other public service corporation in existence at the time of the adoption of this constitution shall have the benefit of any future legislation, except on condition of complete acceptance of all provisions of this constitution, applicable to railroads, transportation companies, transmission companies and other public service corporations: Provided, that nothing herein shall be construed as validating any charter which may be invalid or waiving any of the conditions contained in any charter."

Any company which failed to accept the provisions of the constitution would be deprived of all benefit of future legislation, but neither its charter nor any franchise granted to it previous to the adoption of the constitution would be invalidated in any way under any circumstances.

The validity of contracts is protected by the constitution of the United States, Art. 1, Sec. 10, which forbids the states to pass any laws impairing the obligation of contracts.

Securing a Franchise in Unincorporated Town.

How can we best secure a franchise or right to put a telephone exchange in a small town of 300 people, which is not incorporated. The town, which is in Texas, is owned by a company which will not allow us to put in an exchange.

The company in selling lots and dedicating streets and alleys, reserved all rights to set poles and string wires for telephone and telegraph, as well as all rights to sell liquors, build railways, lay sewers or water mains; in short reserved everything connected with public service.

We understand we can condemn streets and alleys, but that would not give us a right to the lots, and as the lots are sold to hundreds of people, it would make it a hard matter. Kindly let me know through the columns of your paper the best way to pursue.

By making the company defendant in the condemnation proceedings, you could gain the right to erect your poles and wires in the streets and alleys of the town. To get a lot upon which to erect your exchange you would undoubtedly have to purchase it from either the company or some grantee of theirs, although, of course, you might put your exchange outside the limits of the town. The reservation of all rights to set poles and string wires for telephone purposes would not prevent you from using a lot for an exchange. We understand it has been recently ruled by the attorney general's department of Texas that a telephone company has the legal right to erect its poles and string its wires along a country road without securing permission from the county. If the town is not incorporated, the streets and alleys would undoubtedly amount to nothing more than county roads, under this ruling, so we do not see that a franchise is necessary. We suggest that you write to the attorney general's department of the state for a copy of its ruling.

Lincoln Occupation Tax Held Valid.

The Supreme Court of Nebraska has upheld the validity of the Lincoln city ordinance imposing an occupation tax of two per cent upon the gross receipts of all telephone companies.

This ordinance was passed about a year and a half ago, and allowed deductions to be made for the United States and state rentals and tolls, interstate tolls, and company business. This ordinance also provided that the two per cent occupation tax was to take the place of all occupation tax then being paid. At the time this ordinance was passed, the Nebraska Telephone Company was paying $500 per year franchise tax, while the Lincoln Telephone Company was paying the same amount, and, in addition, one per cent of its gross earnings, which it had always interpreted to mean gross earnings only from business originating and terminating within the limits of the city of Lincoln.

Both companies were paying the tax promptly according to law, when the city passed the new two per cent tax ordinance. This law the Nebraska Telephone Company attacks in the courts, on the ground that it increased its taxes in much greater proportion than it did the tax of the Lincoln Telephone Company.

From the time the law was passed until about the first of the year, the Bell company refused to pay the two per cent tax, but last January began paying it under protest, and subject to the decision of the courts. It also made its payments on its gross Lincoln rental and toll business, and all other business done in the county that had the slightest connection with Lincoln. During this time the Lincoln Telephone Company paid its tax on the Lincoln business only, but agreed, in case the suit was decided for the city, to pay taxes on farm telephones connected with the Lincoln exchange.

The decision of the Supreme Court holds that the occupation tax of two per cent is not a double tax, one tax being levied on gross receipts and another on tangible property. The $500 annual payment is held to be in the nature of a rental charge for the use of the streets. It is also decided that the deduction of previous taxes operates equally on all companies, that the collection of tolls received within the city does not invalidate the ordinance although the lines may extend outside the city, and that the company has no standing in court because it accepted its franchise under the contingency of taxation.

To be reported in Northwestern Reporter.

Telephone Finances

Annual Report of Keystone Company.

The statement of earnings and expenses just issued in the report of the Keystone Telephone Company of Philadelphia, including companies owned by it, for the year ended June 30, 1908, shows an increase of income available for interest, reserves and other charges amounting to $38,232.81. The following is a comparative statement of earnings and expenses for the year just closed and the one preceding:

	1908	1907	Increase	Increase Per cent
Gross earnings	$1,051,071.56	$995,752.06	$55,319.50	5.56
Operating and maintenance charges, including taxes and provision for doubtful accounts	539,122.88	522,036.19	17,086.69	- 3.27
Balance available for interest and reserve, etc.	$ 511,948.68	$473,715.87	$38,232.81	8.22
Reserve for renewals	100,000.00	100,346.10	*346.10	*.03
Interest charges	313,112.48	265,629.67	47,482.81	17.83
Net profit for year	$ 98,836.20	$107,740.10	*$8,903.90	*8.26

*Decrease.

Although, as heretofore, no necessary expense has been spared to maintain the property in a high condition of working efficiency, improvements in methods have brought about a reduction in the ratio of operating cost (including maintenance and taxes) to gross earnings from 52.4 per cent for 1907 to 51.3 per cent for 1908.

As is well known, this company has followed the policy of building up an ample reserve fund which, including the amount set aside for 1908, now amounts to 367,212.49. The combined balance sheet of the Keystone Telephone Company of Philadelphia, the Keystone Telephone Company (of New Jersey), and the Eastern Telephone & Telegraph Company at June 30, 1908, was as follows:

ASSETS.

Cost of Property, including stocks		$13,411,380.85
Keystone Telephone Company, of Philadelphia, First Mortgage 5 per cent Bonds Pledged as Collateral	827,000.00	
Materials and Supplies on hand	124,338.87	
Cash at Banks and on hand	133,220.68	
Accounts and Notes Receivable	171,067.36	
Renewal Reserve Fund	76,441.09	
Accrued Assets	39,096.02	
Total Assets		$14,782,544.87

LIABILITIES.

First Mortgage 5 per cent Bonds issued by the Keystone Telephone Company, of Philadelphia		$5,312,000.00
First Mortgage 6 per cent Collateral Trust Bonds issued by the Keystone Telephone Company, of Philadelphia		251,000.00
Three Year 6 per cent Collateral Trust Gold Notes issued by the Keystone Telephone Company, of Philadelphia		600,000.00
First Mortgage 5 per cent Bonds issued by the Eastern Telephone & Telegraph Company		250,000.00
Notes, Accounts Payable, Reserves and other Current Liabilities		463,210.58
Total Liabilities		$6,876,210.58
Renewal Reserve		367,212.49
Capital Stock Issued:		
6 per cent Preferred by the Keystone Telephone Company of New Jersey		1,936,850.00
Common by the Keystone Telephone Company of New Jersey		5,000,000.00
Surplus		602,271.80
		$14,782,544.87

The amount of first mortgage 5 per cent bonds outstanding was increased during the year by $605,000, making a total on June 30, of $5,312,000, of which $720,000 is pledged as collateral security for $600,000 three-year 6 per cent collateral trust gold notes, due March 1, 1910.

During the year the total of 6 per cent collateral trust bonds was reduced to $251,000 through the retirement of $19,000 bonds. No change occurred during the year in the outstanding amount of three-year 6 per cent collateral trust gold notes of 1910, $600,000, or the Eastern Telephone & Telegraph Company first mortgage 5 per cent bonds of 1922, $250,000.

The combined profit and loss account of the Keystone Telephone Company, of Philadelphia, and the Keystone Telephone Company (of New Jersey), also the Eastern Telephone & Telegraph Company for the year ended June 30, 1908, follows:

Gross Earnings		$1,051,071.56
Operating and Maintenance Charges, including Taxes and provision for Doubtful Accounts		539,122.88
Balance Available for Interest and Reserve		$511,948.68
Reserves for Renewals	$100,000.00	
Interest Charges	313,112.48	413,112.48
Net Profit for the Year		$98,836.20
Surplus Account of June 30, 1907	531,101.29	
Less sundry adjustments made in 1908, but pertaining to 1907	27,665.69	503,435.60
Surplus July 1, 1908		$602,271.80

This company has an exceedingly valuable outside plant, and is understood to be in a position where additional business can

be taken on at a cost in lower proportion than the probable increase in income. Further, all slow-paying subscribers have been eliminated, and the business is in a very solid condition.

Citizens' Report Shows Strength of Telephone Industry in Hard Times

Based on the showing made by the Citizens Telephone Company, with headquarters in Grand Rapids, Mich., and operating 26,826 telephones in about 80 exchanges, with 155 toll stations in the small villages and hamlets, Secretary E. B. Fisher's conclusions as to the strength of Independent companies in times of financial stress are of interest.

Predictions were freely made almost a year ago, by enthusiastic telephone men, that the telephone business would continue to grow, and show reasonable profits, in spite of the anticipated dullness in other enterprises. Reports from all over the country have shown that it has done so. Coming from a company admitted in all quarters to represent an organization of the highest type, officered by men whose experience in the Independent telephone business has been a long record of success, and whose reliability of judgment, as well as conservatism in statement of facts, cannot be questioned, the following statement, taken from the annual report of Secretary Fisher is of the greatest significance:

"The Independent telephone companies of the country, our own included, now know from experience what a panic means, and how much or how little it affects them. In the next month after our last meeting the financial depression began; it can hardly be said to be a thing of the past, since many business interests are still feeling its influence. Our company did not entirely escape, and yet we have ample reason for much encouragement. * * * The fact that there was an actual growth in the Citizens system proper of more than 800 telephones is significant and most encouraging. The fact that there was a growth of $43,450.15 in gross income is highly satisfactory. Most other interests in the country have reported a decreasing volume of business, diminishing incomes, gross and net, and smaller outputs.

"It had been suggested from time to time to many of you personally, in conversation and otherwise, that it was believed the telephone business would suffer less in a time of commercial depression or business panic than most other enterprises. It seemed a reasonable theory. Now it is an ascertained fact. Now it is demonstrated that the income of a well-managed telephone company is less affected by such business disturbances than almost all other interests.

"This experience is not singular to the Citizens Company, nor even to the Independent interests. It is so broadly general, indeed universal, in the United States that conclusions founded upon it are sound and safe. Hereafter each and all of us will be able to say that with proper management we can be certain of a reliable gross income, of a fair net result, and that in no other direction among the public utilities of the country is this sort of fact more clear and certain. Of course there has been opportunity for very much greater growth than has been made. All through the year there have been urgent demands for additional service in connection with various exchanges outside of the city, especially in rural service, but the natural tendency after such business disturbances as affected the country in October last and since is to great conservatism, to limiting expansion and expenditure so far as possible. With returning favorable business conditions doubtless there will be some relaxation of this conservatism, and a period of greater activity in both urban and rural telephone development.

"The income and expense accounts are as follows:

EARNINGS.

Exchange rentals	$482,657.37
Long distance income	110,460.45
Other income	10,236.06
	$603,353.88

EXPENSES.

Operating and maintenance, reconstruction and depreciation	$306,709.68
General expense, interest, taxes, etc.	54,673.84
Dividends	233,970.36
Carried to surplus	8,000.00
	$603,353.88

"A year ago the announced increase in dividends paid for the year exceeded $34,000. This year the increase is slightly more than $30,500. The fact that there is such an increase with but about 800 telephones added to our own system is significant of a condition that must be gratifying to all of you. The ratio of earnings per telephone, both from exchange service and from long distance revenue, is quietly and steadily growing. That fact, while the sum per station is not large, is a fact on the right side of the balance and proves a continual thoughtfulness of your interests on the part of the management. The income per station, based upon the gross income of the plant for the average number of telephones in service in the past year, has been $22.83 while the corresponding figures for the preceding year, based upon the average number of telephones, was but $22.59, or 24 cents per station less. * * * The increase in gross income (and dividends) is the more important when it is considered that, as to Lansing especially, a very large sum of money has been invested in preparation for the new exchange, which is to be in service before the year closes, which investment has not as yet earned anything. The sums so invested are receiving dividends, and were they earning, as well, the figures of gross and net income would be considerably enlarged. In lesser degree, but in a similar way, a considerable investment in anticipation of the future business, which is surely coming, is made in Grand Rapids city exchange, and in other exchanges, so that quite a large growth can be cared for without a corresponding increase in investment.

"The table of statistics heretofore given is continued this year with the additional figures for the year 1908. These figures, giving a comparative idea of the growth and development of our plant from year to year ever since its organization, are increasingly interesting and instructive as the years go by. Computations may be based upon them that will afford most satisfactory conclusions.

"The statistical table shows that the total amount of capital stock outstanding at the end of the fiscal year, June 30 last, was $3,066,085, so that there has been a net increase in the capital stock issued during the year of $286,450, a very considerable increase when it is remembered that there were many times during the year when commercial checks, save for payrolls, did not command cash even from absolutely sound and solvent banking institutions, and when people with means for investment felt it obligatory to go slow and wait for better times. Of this amount new stockholders took $162,165, and the balance was distributed among the 482 purchasers of stock who already were stockholders. The sales of stock since the beginning of the present fiscal year, the first of July, have been encouraging. The addition of 377 new stockholders during the year makes the total number of stockholders in the company very nearly 3,000, and the total number of stockholders interested in the company considerably in excess of that figure. The policy of the company in this particular, as heretofore stated, will be continued in the future because every person financially interested in the company becomes a partisan of the investment and a factor of strength. The number of stockholders in the company has been increased since the end of the last fiscal year between sixty and seventy, and the inquiries from those who have heretofore held aloof from the investment are increasingly numerous. The fact that the telephone business in general has been so little affected by the recent panic is beginning to be a matter of common knowledge throughout the country, and is affecting possible investors noticeably."

Practical Questions and Answers

Phantoming a Phantom.

Will you kindly let me know if another circuit can be arranged on a phantom circuit. I am told experiments have been made in this line with considerable success. To explain by example what I mean, on a circuit as shown in Fig. 1. In this diagram are indicated two physical metallic circuits of .110 copper wire. The phantom gives three circuits. Can a fourth be arranged on the wires above as they stand, or can they be used in any way to arrange a fourth circuit?

It is not possible to secure any additional telephone circuits out of the arrangement you indicate in Fig. 1, except

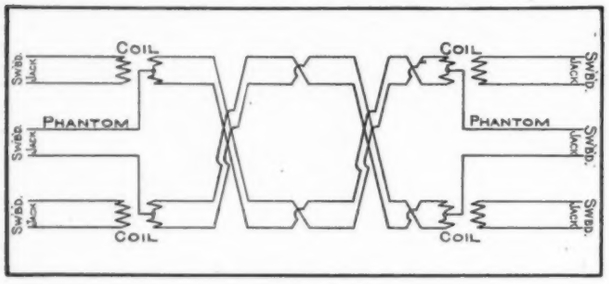


Fig. 1.

by using an earth return, which would be unsatisfactory. Of course the physical circuits composing the phantom can be simplexed or composited for telegraph service without interfering with telephone service.

It is theoretically possible to get a third phantom from four physical circuits, as shown in Fig. 2, where the third phantom is taken off the center points of repeating coils in the other two phantoms. This plan is capable of even further extension with eight physical circuits. A general rule may be stated that it is possible to secure from any number of physical circuits, which number is one of the ascending powers of two, a total number of talking circuits (metallic, physicals and phantoms) equal to twice the number of physical circuits minus one. This is carried out in the following table to show the principle:

Physical circuits.	Phantom circuits.	Total circuits.
2	1	3
4	3	7
8	7	15
16	15	31

It is necessary for the successful operation of any phantom that the physical circuits be transposed and the phantom also, if there are more than two physical circuits, to

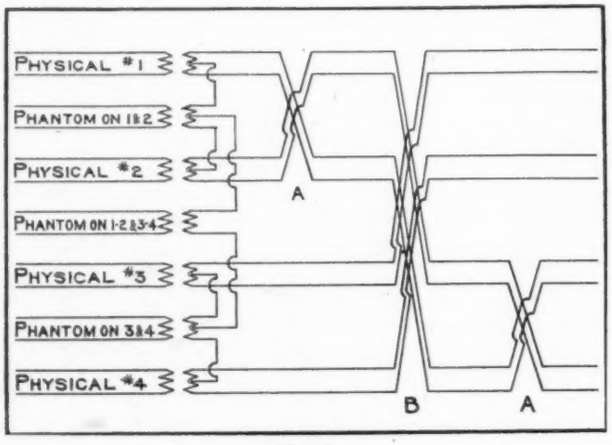


Fig. 2.

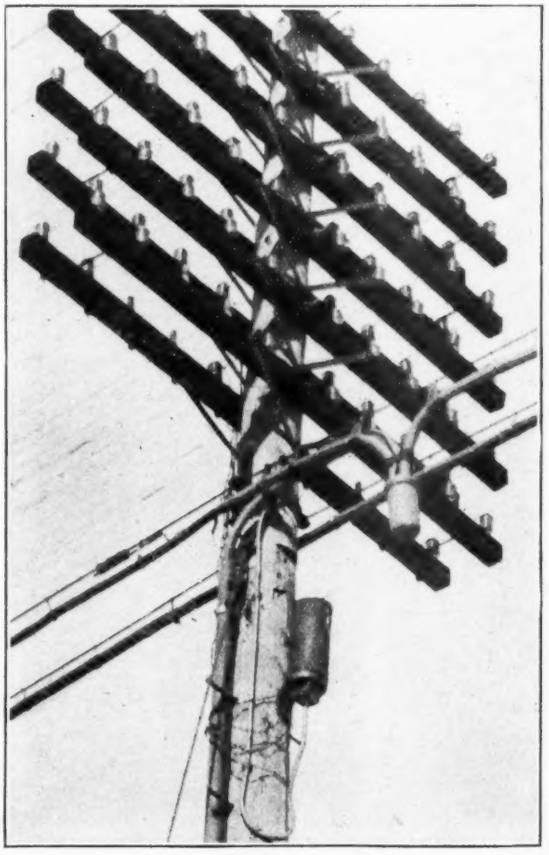
avoid cross-talk. When it is attempted to phantom open-wire lines as in Fig. 2, the transposition system becomes involved in great complexity and such transpositions as the one at *B* in the figure are necessary; this further complicates the location of line trouble from the office and complicates maintenance; it is also bewildering to the lineman who is out after a case of trouble. The arrangement has never been employed in regular service, so far as we know. A large amount of use is made, however, of single phantoms from two physical circuits. Further objections to the scheme indicated in Fig. 2 appear when planning a lay-out of lines for handling traffic, owing to the lack of flexibility and the transmission losses occasioned by numerous repeating coils.

Lightning and the Matthews Joint.

A possible objection to the use of the Matthews joint for splicing cables might be that, on account of the abrupt turn in the cable, lightning will easily go through it instead of going on to the main frame. Please let me know what you have to say about that.

The liability to puncture by lightning of the lead sheathing of telephone cables at sharp bends or corners arises from the fact that at such places the bent cable becomes oval in cross-section, and the "lay" of the pairs is disturbed. Some of the pairs become crowded against the sheath, and in the event of a very short bend the sheath is likely to buckle inwards on the inner side of the bend; this gives rise to excessive pressure of the conductors against the sheath, and may even abrade the insulation so as to produce faults.

The grounded messenger and grounded cable sheath will cause



The Matthews Joint.

such sharp bends to become the points of least resistance to lightning discharges. At such bends the insulation of cable conductors may be disrupted, providing the cable circuits extend into open wire and are therefore exposed to electrical storms.

So far as the Matthews joint is concerned, it would appear to be no difficult matter to make it as immune from such breakdowns as the balance of any well installed cable. Sharp bends should be avoided because of the very nature of the internal construction of a cable, and too abrupt bends in entering Matthews joints should be avoided as well as at any other place or part of the cable whatever.

Howler Circuits.

Will you please publish a satisfactory howler circuit?

Figure 1 shows a very common howler circuit, which is used in connection with a ringing dynamo. The interrupter wheel,

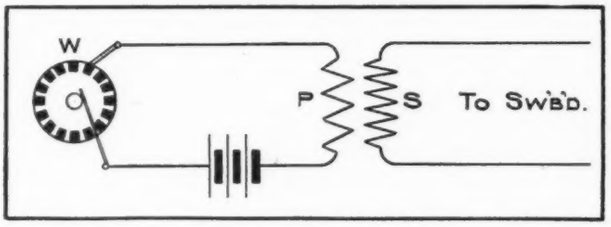


Fig. 3.

W, is on the end of the generator shaft, and makes and breaks the battery current through one winding of the induction coil or transformer, *P S*. This interrupted current generates a rather high voltage in the secondary of the coil, which is wired to keys or jacks on the switchboard or test desk. If the generator shaft runs at 1200 r. p. m., there should be about 40 segments on the wheel *W*.

In a magneto exchange, where there is no ringing dynamo, as when a pole-changer is used, the scheme shown in Fig. 2 will give good results. The buzzer is a common vibrating battery bell, with the clapper cut off to allow it to vibrate at high speed. Wire it in series with a few dry cells and the primary

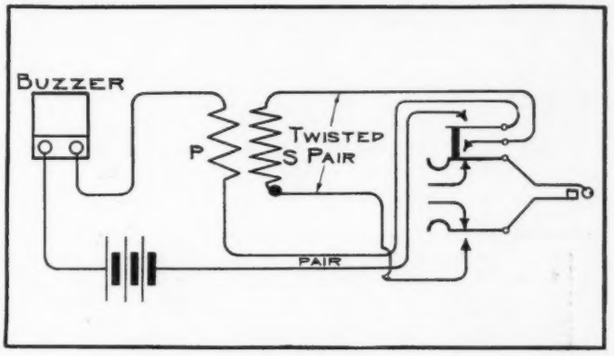


Fig. 4.

of a good induction coil, *P. S.* Since the battery and buzzer ought not to be allowed to run all the time, the primary circuit should be wired to a special contact on the howler key, as shown at *K*. The induction coil should be of the local battery type, with a rather high ratio of secondary to primary turns.

The Canadian Convention

By W. R. Rutherford

Determination to extend their activities and furnish the people of Canada with proper Independent telephone facilities, together with enthusiasm over the great results already achieved in this young Canadian industry, were the sentiments most in evidence at the convention of the Canadian Independent Telephone Association, held at Toronto, Sept. 9.

The delegates, to the number of about a hundred, were welcomed by Alderman Keeler, and, on behalf of the association,

J. F. Demers.

F. Page Wilson.

Francis Dagger.

an address of reply was made by Mr. A. C. Wisner, of Jordan, Ont.

The treasurer's report showed that obligations have been met, and a small balance is in hand.

The election of officers resulted in the return of the same as held office last year, except that Mr. Alpheus Hoover, an ex-president, takes the place on the executive committee of Mr. J. Dyke, of Fort William. The officers and executive committee for the coming year are, therefore, as follows: President, J. F. Demers, M. D., Levis, Que.; vice-president, W. Doan, M. D., Harrietsville, Ont.; executive committee, F. Dagger, Regina, Sask.; A. Ochs, M. D., Preston, Ont.; C. Skinner, Sherbrooke, Que.; T. R. Mayberry, M. P. P., Ingersoll, Ont.; Alpheus Hoover, Green River, Ont.; G. W. Jones, Clark, Ont.; E. Hart, M. D., Brantford, Ont.; Levi Moyer, Beamsville, Ont.; A. D. Bruce, Gormley, Ont.; secretary-treasurer, F. Page Wilson, 405-406 Confederation Life Building, Toronto, Ont.

President Demers in his address expressed a special welcome to the "cousins from across the border." Dr. Demers recalled the contest some of the Independents had carried on with the

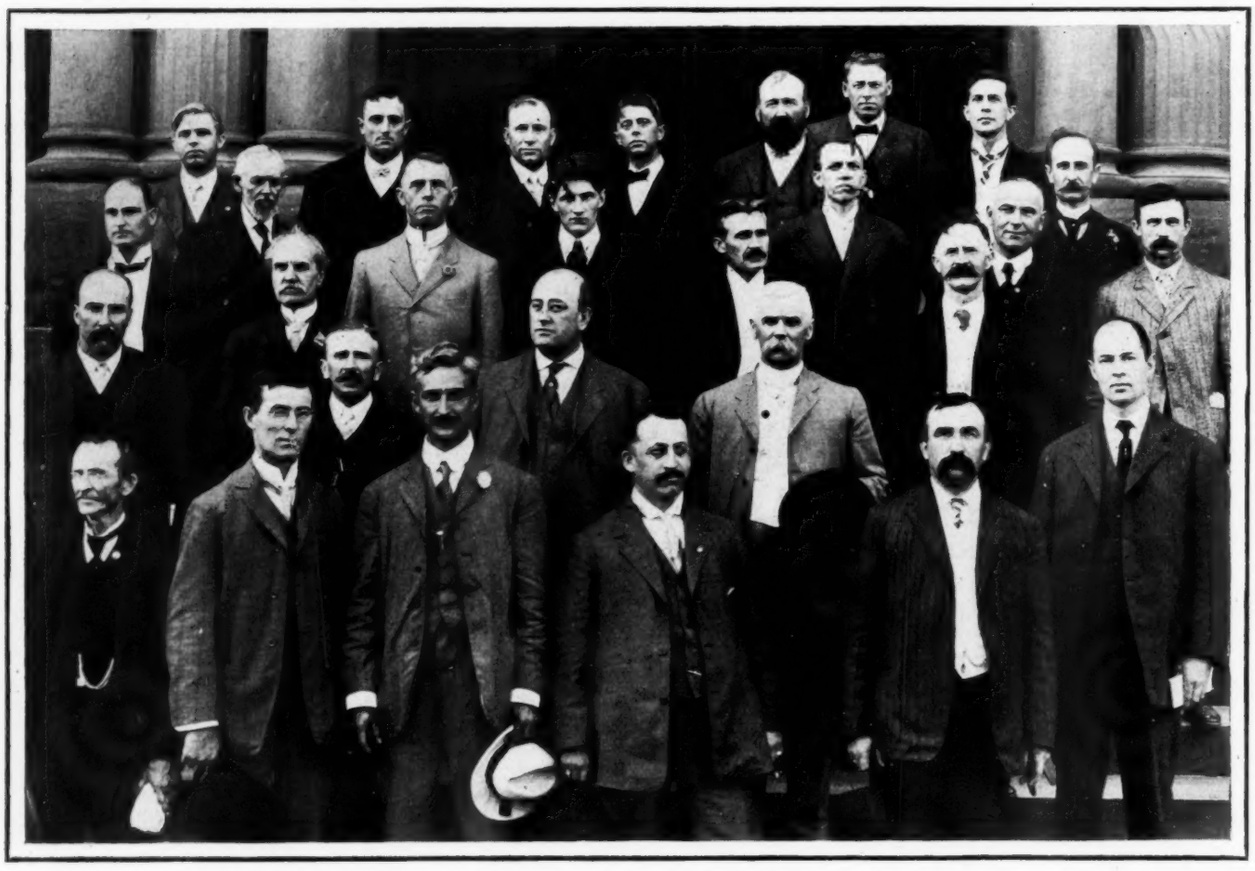
Canadian Pacific Railway Company, in order to get Independent telephones into the offices of that corporation, with which the Bell had made exclusive contracts. At first the Independents seemed unable to accomplish anything, as the railway company simply said it sympathized with them, but was powerless, because of its contract with the Bell company, to help them. The Independents did not take this statement seriously, however, and refusing to give up, had learned that the railway companies could help themselves, and could allow Independent telephones in their offices. The National Telephone Company has just completed a contract with the Canadian Pacific for telephones in its offices in Quebec City, and has similar contracts with every railway coming into Quebec and Levis, service being paid for at regular business rates. Negotiations for a private branch exchange of some 400 telephones are now being carried on with the largest hotel in the Province of Quebec, owned by the Canadian Pacific Railroad, and there is a good prospect of success in obtaining this contract.

The Bell company likewise had claimed a monopoly of telephones in the offices of the Richelieu & Ontario Navigation Company, but the Independents have broken into that contract also, and now have contracts for telephones in the navigation company's Quebec office at the business rate.

Good reports have come from the Independent telephone companies in New Brunswick. The citizens of that province, since the Central Telephone Company, a year ago the strongest Independent telephone company in Canada, sold out to the monopoly, have been complaining of poor service and excessive charges. Another Independent company has been organized recently in the city of Woodstock to again compete with the Bell company, and only a month ago Campbellton also reported its intention of putting in a municipal telephone plant to compete with the Bell exchange. These two cities have had experience with two companies, and after having again been placed under the limitations of a monopoly service, are now crying for relief in an Independent company to serve them. This condition proves that the claim of the Bell company that a dual system is a burden and an additional servitude placed on the public is not true.

Speaking of what was being done in his own province, and particularly in the city of Quebec, Dr. Demers said that every difficulty has been met and overcome. The proposition has been financed, more than 3000 contracts secured, and the engineers have now completed their plans, which call for an extensive underground system, a fireproof building, and the highest grade of central office equipment which can be purchased.

Secretary F. Page Wilson reported a remarkable development of interest in Independent telephone lines, particularly in the province of Ontario, since the last convention. The estimated number of Independent telephones in operation in Canada a year ago was 18,000. It is now probably 25,000. Mr. Wilson urged that the members make prompt and complete replies to requests for information sent out by the Association, and impress upon their neighbors the advantage of keeping in touch with the Association, so that the combined strength of the companies might be properly realized in order that opposition to their interests may be more easily overcome.



A Group of Prominent Delegates to the Canadian Independent Telephone Association's Convention at Toronto.

The number of Independent companies formed and in existence in the Dominion at this date, by the secretary's list, was 338. The number of companies enrolled and paid up on the first of September, was 65, besides seven municipalities. Ontario leads the provinces in the number of Independent companies and in the number of new companies formed during the past 12 months. The National Telephone Company of Quebec, headed by the president of the Association, leads the Dominion in size and importance. No great forward movement is re-

ported in the Maritime Provinces so far, according to Mr. Wilson, but indications are promising. In Nova Scotia a few new companies have been formed, and in New Brunswick there has been a regular revolt against the extortions and poor service of the monopolistic company. In the West, Manitoba has bought out the Bell company root and branch, but while that company has passed out of existence in the Province, it was only on very high terms of purchase, and under conditions not calculated to bring out the full benefits of Independent competition. The government of Alberta has acted more or less similarly, although it was able to negotiate what was probably a better bargain. Saskatchewan, where many small companies had been formed, seems to have trusted its people to a greater extent, and a very rapid development of cheap telephone facilities may be looked for in that province. British Columbia is also taking quite an interest in the Independent movement, and several flourishing local companies have been established.

Every effort has been made by the Publicity Committee to educate the public, through newspapers and otherwise, to the value of competition against the telephone monopoly.

The secretary mentioned the able effort of Mr. Phil. Bowyer, M. P. P. in the Ontario House, to do away with the power of municipalities to grant exclusive franchises. The Executive Committee has seconded these efforts. Hon. W. J. Hanna, Provincial Secretary, and a large number of the committee of the House looking into the matter, were evidently in favor of the contentions of the Independents, but the motion did not quite carry, chiefly on account of technical reasons, that is, difficulties incidental to an interference of the Provincial legislators with rights granted by the Dominion government, but the campaign was attended with admirable results so far as the attitude of the Ontario government toward the Independent movement was concerned. Considerable complaint having been made by the Independent companies as to the stringency and consistency of some regulations under the "new companies" statute relating to dimensions and height of poles, the matter had been brought to the Provincial Secretary's attention and promised to be settled in a satisfactory way.

Circulars have been sent out to every newspaper in Canada, and to all Independent companies, warning the latter against buying any apparatus or supplies from Bell manufacturing companies.

The afternoon session was devoted largely to discussion of a number of live topics. Dr. W. Doan spoke on "Bell Connections," his address bringing forth much discussion, the general opinion being decidedly against such connections. Mr. C. Skinner dealt with "Independent Telephones at Railway Stations." Mr. A. R. Walsh spoke on the "Organization of Rural Companies," dealing with the relative merits of mutual and joint stock formations. Mr. A. Hoover discussed "Rates to be Charged, and the Best Form of Collecting," and Mr. A. D. Bruce the question "To What Extent Should Free Service be Given?" There was animated discussion of this topic and the general thought was that too much latitude is generally allowed in the matter of free service. Mr. Wisner, of Jordan, Ont., spoke of "The Division of Territory between Telephone Companies," Mr. Henry Sneath on "Toll Line Connections: How Best Effected," Dr. M. Gee on "Our Interests in Towns and Cities," Mr. T. R. Mayberry, M. P. P. of Ingersoll, on "The Independent Movement in Towns and Rural Communities," and Dr. A. Ochs on "Exclusive Franchises and Government Regulation." "The interest in towns and cities," said he, "is clearly becoming continually a more live question, as there is a tendency to branch out." Exclusive franchises were pointed out to be a great detriment to the development of the Independent movement. It was his opinion that there is no better way of getting long distance connection than for the government to take hold of the long distance lines.

A resolution was accepted, on motion of A. F. Wilson, seconded by A. D. Bruce, favoring the formation of branch associations in the various sections of Canada

On motion of Dr. Ochs, seconded by C. W. Davidson, the president was authorized and directed to nominate a delegation to appear before the Ontario government in support of the resolution adopted at the last convention regarding exclusive franchises in Ontario, and operating companies are to be requested to urge their local members to be present and support the delegation.

Dr. Doan and Mr. C. Skinner presented resolutions which were unanimously adopted, stating that,

"Whereas, the Bell company is proposing long distance connections to local Independent telephone companies in various parts of Canada, and in the opinion of this convention such are bound to injure the cause as a whole, this Association frowns upon and denounces any such foolish connection as injurious to the people as a whole.

Mr. F. Page Wilson, seconded by Dr. Doan, presented a resolution pointing out that wherever the Northern Electric Company and the Kellogg Switchboard & Supply Company, manufacturing companies affiliated with the Bell interests, against the interests of the Independents, seek to get the latter to buy supplies of them, and such purchases help to provide the Bell interests with funds to fight the Independent movement, so the Association denounces the purchase by Independent companies of any switchboards, telephones, or supplies from any other than strictly Independent manufacturing companies.

LETTERS ON PRACTICAL SUBJECTS

An Interesting Toll Line Test.

In Fig. 1 is shown the relation of three toll circuits over which a test was made to determine the location of a ground on one of them. This fault was a "swinging" ground on both sides of the circuit *A B* between the towns *R* and *S*. All testing had to be done from town *R*, and, on account of the high

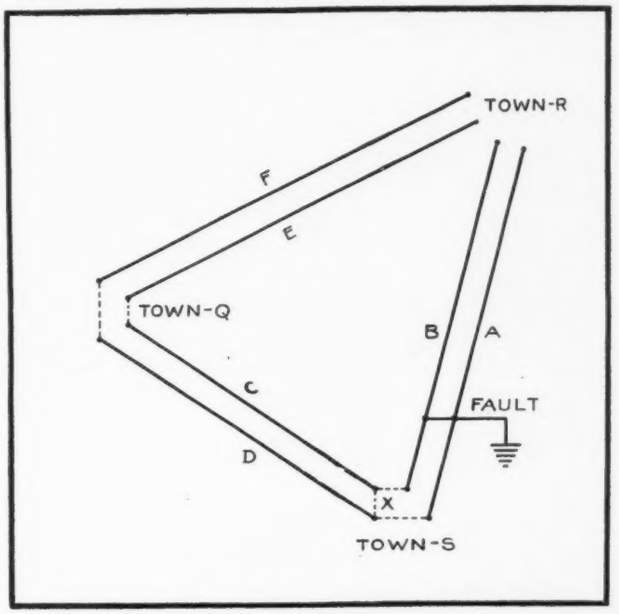


Fig. 1.

resistance of the ground across *A B*, an accurate reading could not be secured by merely taking a loop reading from town *R* on *A* and *B* through the fault.

Not having an additional parallel circuit between *R* and *S* recourse was had to using a circuit from *R* to town *Q* and then over a circuit between towns *Q* and *S*. The three circuits were then cut through (as shown by the dotted lines) to secure the arrangement indicated by Fig. 1.

A straight loop test with the bridge was first made over wires *E C B* from *R*. The resistance of these circuits, in series, equaled 1,000 ohms. A Varley test over this same circuit with connections as shown in Fig. 2 was then taken. The resistance in the rheostat arm necessary for a balance equaled 139 ohms.

In order to secure the resistance of the side of the circuit

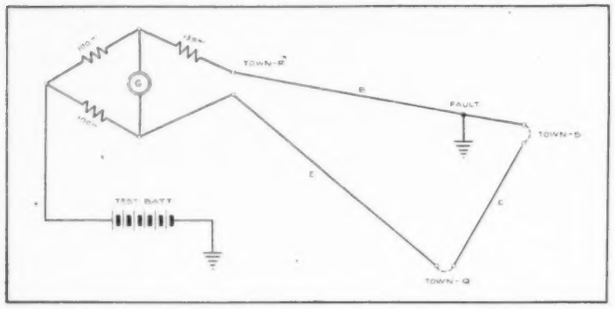


Fig. 2.

made up of wires *E C*, a loop test was taken over *E C D F* through a cross placed at town *S* on *C D*. This arrangement is shown by Fig. 3, and the resistance of the loop was 1,132 ohms, which made the resistance of wires *E C* in series equal to one-half this, or 566 ohms.

Now, since the resistance of circuit *E C B* was 1,000 ohms on a straight loop test, and that of wires *E C* was 566 ohms, the resistance of wire *B* was obviously 100 — 556, or 434 ohms.

Now, it is well known that in order to secure an accurate Varley loop test (using the customary methods of calculation) both sides of the circuit over which the test is made should be equal in resistance, the fault, of course, being only on one side of the circuit.

Here we have a test made over a circuit, the two sides of which are unequal in resistance.

Considering the wires *E C* as one side of the circuit, and wire *B* as the other side, and desiring the resistance of one wire from the town *S* to the fault it is possible to use the following method of calculation:

Let *X* equal the resistance of wire *B* from *S* to the fault. Then, since the resistance of *B* equals 434 ohms, *E C*, 566 ohms, the balancing resistance in the Varley loop equals 139 ohms:

$$\text{Then } 139\omega + 434\omega - X = 566\omega + X$$
$$-2X = 566\omega - 573\omega$$
$$-2X = -7\omega$$
$$2X = 7\omega$$
$$X = 3\tfrac{1}{2}\omega$$

Therefore 3½ ohms was the resistance of wire *B* from town *S* to the fault.

Or, dispensing with the algebra, we can devise a rule to fit such a case.

Considering the town *S* as the objective point from which the distance to the fault is to be determined, and since the wire *B* is the low resistance side of the circuit over which the Varley loop is taken, and the wires *E C* together are the high

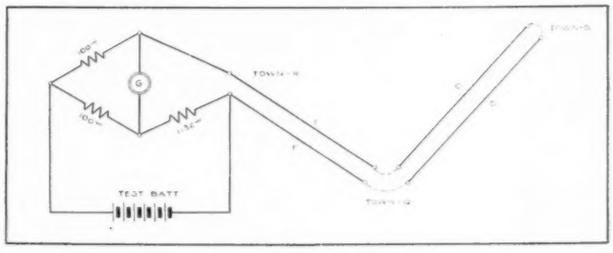


Fig. 3.

resistance side, then our rule could be stated something like this:

Take the Varley loop reading, in ohms, add the resistance, in ohms, of the low resistance side of the circuit, then from the sum subtract the resistance, in ohms, of the high resistance side of the circuit and divide the remainder by 2. This will equal the resistance of one wire from the objective point to the fault.

The test above described was made to locate an actual case of trouble, and proved to be correct.

Hannibal, Mo. Jno. B. Doolittle.

Telephone News

Electric Railway Men to Discuss Disturbances on Telephone Lines.

Considerable interest is being manifested among telephone men in a paper to be read by Mr. E. G. Hindert, of Ohio, before the Central Electric Railway Association convention in Indianapolis on September 24. Mr. Hindert's subject is, "The Electric Railway Return Current and Electric Induction." There have been a number of instances where telephone companies have been obliged to abandon their telephone leads and build a considerable distance away from the traction wires, owing to the increased induction resulting from the adoption of the single phase or alternating current system of lower transmission. It is regarded of the utmost importance that these disturbing elements shall be controlled or abated, and for this reason representatives of the telephone companies will be present to discuss Mr. Hindert's paper.

Service Sold.

The Independent telephone companies throughout Indiana are endeavoring to make it plain that they are not organized to lease telephone instruments to their patrons. The business of a telephone company is to sell service for a price, based upon the cost of that service. A company installs instruments, strings wires, maintains switchboards and other accessories, in order to be able to furnish the service which it sells. The final point sought to be made clear to the public is that, the greater the number of telephones the greater the cost for service, while if charges were for the lease of telephones there might be some justice in the argument that the greater the number of telephones the cheaper should be the service.

Home Telephone Company About to Complete Exchange in Spokane.

That the progress of the Home Telephone Company's construction work in Spokane is being carried on in accordance with the conditions of their franchise is the substance of a report to the council, filed by the board of public works, and headed by W. W. Witherspoon. Appended is a letter from W. W. Hindman, secretary of the telephone company, in which he says that the company has purchased property for the erection of a sub-exchange in Augusta avenue.

The investigation was in compliance with a resolution intro-

duced in the council some time ago by Councilman Leonard Funk to determine if the company was living up to the terms of its franchise calling for the progress of its construction. The report follows:

"Having investigated the work being done by the Home Telephone Company under their franchise, will say that their exchange building is practically completed, and they are at present laying conduits on North Monroe street."

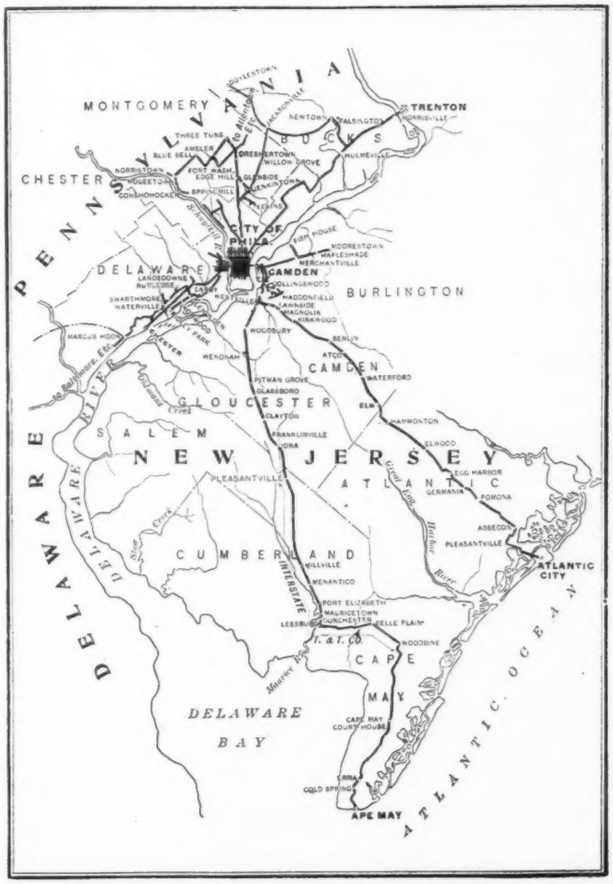
Secretary Hindman says in his communication that the financial condition prevailing at one time held up the expedition of the work, but that at no time was consideration given to the abandonment of the project by the company. He adds:

"We have every reason to believe that in a short time the work will be pushed to an early completion. The company is acting in good faith and intends to carry out the terms of the franchise. A sub-exchange is to be established on property purchased on Augusta avenue. The equipment is now manufactured and ready for shipment."

The Keystone Telephone System.

The magnitude of the Independent telephone system now operated by the Keystone Telephone Company of Philadelphia becomes partially evident on examination of the accompanying maps, reproduced from the annual report just issued.

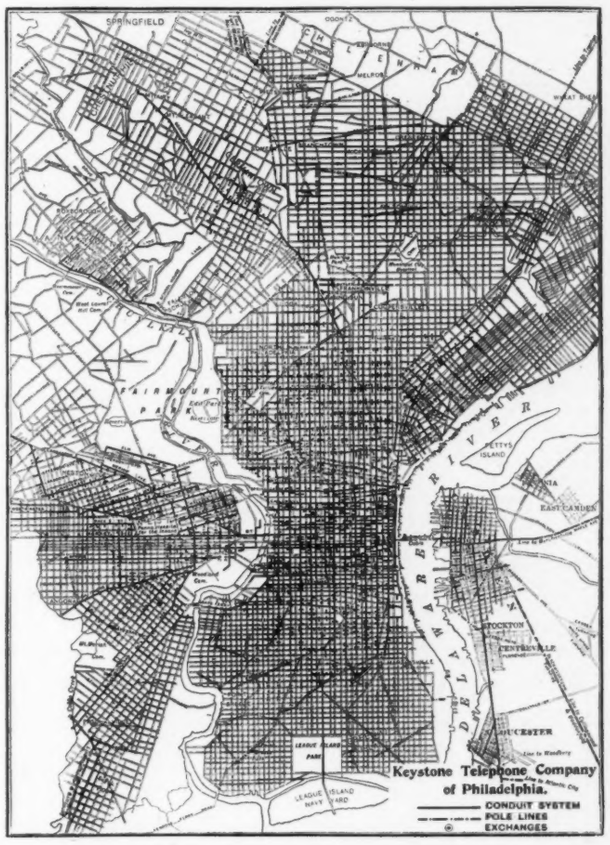
At the close of the last fiscal year the property consisted of the Keystone Telephone Company of Philadelphia, which holds a perpetual franchise from the State of Pennsylvania, and a



Territory Served by the Keystone Telephone Co. of Philadelphia and Its Constituent Companies.

perpetual franchise from the City of Philadelphia; the Keystone State Telephone & Telegraph Company, holding a perpetual charter in thirty-eight boroughs and townships, and the Eastern Telephone & Telegraph Company, which holds unrestricted franchises in the cities of Camden, Gloucester, Woodbury, Cape May, Merchantville, and all other towns in the counties of Camden, Gloucester and Cape May in the State of New Jersey, and also controls the Camden & Atlantic Telephone Company through ownership of a majority of its capital stock.

During the past year the Keystone State Telephone & Tele-



Philadelphia System of the Keystone Telephone Co.

graph Company has been merged with the Keystone Telephone Company of Philadelphia, a proceeding which, although not materially affecting the size of the field covered under single control, has greatly simplified the operating and accounting and effected a substantial saving in operating expense.

During the past fiscal year a large amount of work has been done in the way of increasing toll facilities. In some cases new lines have been built over private right-of-way, and the company is in a better position than ever to meet the needs of the large users of service in its territory.

Among other additions noted in the report are the following:

Additional conduits have been constructed in Philadelphia and Camden; the capacity of the cable system has been greatly increased in both cities; switchboard facilities have been increased wherever requirements made it advisable and all work under construction at the date of the last report has been completed.

The size of the plant is further indicated by the following figures:

Total switchboard capacity, all exchanges, 26,000 lines; conduit system, 12,463,000 duct feet of conduit located in over 320 miles of street and requiring 6,852 manholes; in these conduits are installed 2,400,000 feet of telephone cable of various sizes, the average capacity being over 100 pairs; there are now 335 miles of toll lines, and over 3,000 miles of toll circuit; on June 30, 28,455 telephones were in service.

The officers of the company, all of Philadelphia, are: Nathan

T. Folwell, president; James Collins Jones, vice-president; William W. Wharton, secretary and treasurer; C. E. Wilson, general manager.

Telephone Company Fights Order to Remove Poles from Streets.

At Ithaca, Mich., the telephone company and the village are at odds, and injunctions are being served as fast as the courts will issue them. Recently the council, in passing an ordinance to have Pine River avenue paved, also ordered the Union Telephone Company to remove all its poles to alleys. The company thought it should not be compelled to bear the entire expense and took no action. An injunction was issued to restrain the village from molesting its poles, but the president of the village, hearing of this before the injunction was served, gathered a force of men and set about tearing down the company's poles and wires. He stopped when the injunction was served, and another injunction was procured ordering the village not to interfere with the reconstruction of the system, and the company set about putting up the poles again.

The company is operating under two franchises, one procured from the Gratiot County Telephone Company when the latter company was bought out by the Union company, and the other later obtained from the council. The trouble will probably get into the courts.

How They Meet Unfair Attacks in Michigan.

The advertisement reproduced in the accompanying illustration, the original of which took a prominent half-page space in the Sunday issue of the *Courier-Herald*, of Saginaw, Mich.,

THE SOUTHWESTERN TELEGRAPH AND TELEPHONE COMPANY
OFFICE OF GENERAL SUPERINTENDENT

Dallas Texas, August 21, 1908.

CIRCULAR #166.

ALL MANAGERS:

Within the next few days, you will receive an article published by the Boston News Bureau, commenting upon the financial instability of the Independent Telephone Companies.

Please see that copies are distributed by you personally, among the newspaper people, brokers, financial institutions, and social clubs.

If you still have copies left hand the balance to the most influential people in your town, one copy to each person.

Yours truly

C. A. Gates,
General Superintendent

APPROVED:

J. E. Farnsworth,
Vice-President & General Manager

Reproduction of Circular Letter to Exchange Managers Sent Out by Bell Company.

shows how an Independent telephone company can turn an unfair attack to its advantage. The *Boston News Buureau*, vouched for by a company of large resources, might have a slight influence with persons not familiar with its methods and reputation. But any person who has ever read the article in *Everybody's Magazine*, to which reference is made in the advertisement, will quickly gather the entire proposition lying behind the printing of the recent attack on Independent telephone securities, the distribution of which has been so widely pro-

The Saginaw Courier-Herald

Recently there was mailed to the representative business and financial men of Saginaw and Bay City a letter, a copy of which is as follows:

"Michigan State Telephone Company:

SAGINAW, MICHIGAN, AUGUST 14, 1908.

DEAR SIR:—The Boston News Bureau, one of the most reliable and authoritative financial papers in the country, has published On August 6th, an interesting and thorough article on financial instability of the independent telephone companies, and I am herewith enclosing a copy of this issue for your own personal information, the writer believing that often you may become interested in different securities, and to himself the securities this article is particularly worthy of every investor's attention. Yours very truly,

H. R. MASON, Division Mgr."

It is evident that the whole object and purpose of sending out such a letter, was to attack the integrity and standing of the Saginaw Valley Telephone Company, by discrediting its securities, that is, its stocks and bonds issued and held by the 400 or more residents of the Saginaw Valley, although, cleverly enough, no particular company was named.

The newspaper clipping enclosed with the letter purported to be from the Boston News Bureau, one of the most notorious "accelerators" (for pays of public opinion published in the United States. Proof of this may be found in Everybody's Magazine for October, 1905, on pages 488 and 489.

Mr. Mason holds only a subordinate and salaried position with the company he represents and probably has not and never had a dollar invested in the telephone business.

His scurrilous and back-handed attack upon a legitimate competitor of his employer and his attempting to advise and warn the people of this community against telephone investments can be considered only as a very daring piece of presumption.

It seems improbable that the Michigan State (Bell) Telephone Company were cognizant of, thereby becoming a party to his attempt to injure a legitimate competitor.

The Saginaw Valley Telephone Company, with its 10 years' record of square dealing and fair treatment of the public, does not exactly feel called upon to defend itself against such anonymous attacks, except to warn its many stockholders, patrons and friends that these underhanded attacks may be repeated.

Most respectfully, SAGINAW VALLEY TELEPHONE COMPANY,
John L. Jackson, Vice President.

SAGINAW VALLEY TELEPHONE COMPANY

Telephone Bldg., cor. Germania and So. Jefferson Aves., Saginaw, Mich.

Reproduction of Half Page Advertisement in Sunday Paper.

moted by agents of the company which desires a monopoly of the country's telephone service.

As for the employers of Mr. Mason, the Saginaw Valley Telephone Company may have dealt too leniently with them. For tracing the acts of a company which advertises so persistently one policy for its subsidiaries in all parts of the country, it may be unnecessary to obtain evidence on a particular proposition from all sections. Officers of Independent companies who have not already seen copies of letters similar to that shown in the first illustration may draw their own conclusions as to what is going on in the territory where their own exchanges are located.

High Finance Complications in Nashville.

An extremely interesting and sensational legal controversy begun in Nashville, Tenn., between the Cumberland Telephone & Telegraph Company and John T. Landis, of the Landis Banking Company of that city, promises to be a long drawn out affair.

The first suit was filed in August by the Cumberland Telephone & Telegraph Company against John T. Landis and the Landis Banking Company, asking for an accounting of the joint affairs of the two interests and for an injunction restraining Landis from disposing of any stock of the Cumberland company or any other stock of any other corporation he might hold. This suit developed the fact that some years ago President James E. Caldwell, John T. Landis and other Cumberland Telephone officials organized what they call the Southern Telephone Development Company under the laws of New Jersey. This company was for the purpose of underwriting all new issues of stock put out by the Cumberland Telephone & Telegraph Company. John T. Landis was elected president of the company and the proceeds from the operations of this company were to be distributed between the interested parties after President Caldwell of the Cumberland company had received half the profits.

The Cumberland company has a provision in its by-laws providing that all new stock issued must be first offered to old stockholders at par, regardless of the market value of the stock, and all recent issues of the stock, amounting to more than $10,000,000, have been sold in this way, the treasury of the Cumberland company receiving only par for the issues. The practice of the Southern Telephone Development Company was to send out circulars to all stockholders and inform them of an approaching issue of stock, informing them of their right to buy their portion of this stock. A blank was

attached, however, on which the stockholder could assign his rights to the new stock to the Southern Telephone Development Company. In this way the Southern Telephone Development Company is alleged to have bought a goodly portion of the last $10,000,000 of stock issued at par when the market price has been in excess of par for fifteen years. The issue of February, 1906, was sold at par largely to the Southern Telephone Development Company, and immediately resold in the open market for $115. The profits on these transactions were divided, it is said, President Caldwell of the Cumberland company taking half, and the remainder being divided between Landis and other Cumberland Telephone company officials.

Just how the friends of many years chanced to get at outs is not stated in either the suit against Landis or in his answer.

In his reply to the charges brought in the suit of the Cumberland company, John T. Landis claims that the Cumberland company owes him $50,436 commission on the sale of stock underwritten by the Southern Telephone Development Company, and offers a severe criticism of the management of the Cumberland company. He further says:

"In pursuance of such purpose it has, under the existing injunction unwarrantably tied up all the funds and securities of defendants Landis and Landis Banking Company, whether belonging in the account of the said Southern Telephone Development Company or not; and also by means of telegrams and other communications sent to the bankers and brokers carrying stocks for said respondent to induce them to foreclose their accounts and compel the payment of the funds standing charged against said stocks in their possession—such communications as just indicated having been sent by the said James E. Caldwell, president of the complaining company, immediately upon the filing of this bill; and one of the said brokers—namely, J. W. Bowen & Co., of Boston, Mass., with whom respondent Landis Banking Company has on deposit 1735 shares of Cumberland Telephone & Telegraph Company stock, and to whom it owes about $171,000, has been so induced to call said respondent for said large sum, to be paid on Wednesday next; and others will probably be so induced by the said injunction, and officious inference of complainant through its said president, to make similar demands in the early future and enforce the same, to the very great injury and damage of said respondent banking company, and to the utter destruction of respondents. And as a consequence of the injunction in this case, all the funds of respondent Landis Banking Company have been tied up and especially its funds on deposit in Fourth National Bank of Nashville, with the result that a check for $7888 given by said respondent on said bank in favor of Nashville Trust Company before the bill in this case was filed but not presented until afterwards, in payment of 68 shares of Cumberland Telephone & Telegraph Company stock, was refused payment and protested for non-payment.

"And in further pursuance of its purpose to break up and demoralize the business of respondents, the said complainant both shortly before, and since, the said compromise was agreed to and repudiated by it, has wrongfully and wantonly refused to transfer to purchasers stock purchased by the customers of respondents and sent in for transfer, and has thereby completely and effectually blocked respondents from dealing in the stocks of complainant company with its customers, wholly separate and distinct from any stock involved in this controversy—in one instance, complainant company not only refusing to transfer 37 shares of said stock as requested when sent in to it by respondents for that purpose, but withholding and refusing to return the original certificates sent to it for transfer, which original certificate for 37 shares it still wrongfully withholds and retains. And concurrently with the filing of this answer, respondent is filing its petition for mandamus to compel complainant to transfer said stock in accordance with its duty."

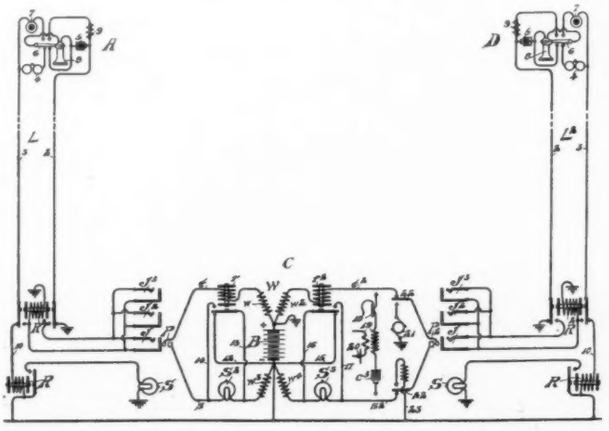
The case will be heard by the December term of the Chancery Court in Nashville, but the indications are that each contending faction will carry the case to the Supreme Court before surrendering.

Telephone Patents

SUPERVISORY SYSTEM FOR TELEPHONE LINES.

W. W. Dean, Chicago, Ill., patent 898,195, Sept. 8, 1908.

The subject matter of this patent covers a supervisory system for telephones. The stations *A* and *B* are connected to line re-



lays *R*, and cut-off relays R^2, as shown. The cord circuit is a two-wire cord circuit, and a novel feature consists in the use of only one relay on each end of the cord circuit for controlling the supervisory lamp. Repeating coils *W* are used for furnishing current from the central battery *B*, and the answering side of the cord circuit is provided with a supervisory lamp S^3, and the calling cord with a supervisory lamp S^2. These are serially included in the cord strands, and when the subscriber's receiver is on the hook, battery current flows through the supervisory lamps through the cut-off relay to ground, thus lighting the lamp. When the receiver is removed from the hook, battery current flows through the relay *r*, and this closes a shunt circuit around the lamp S^2, thus extinguishing it.

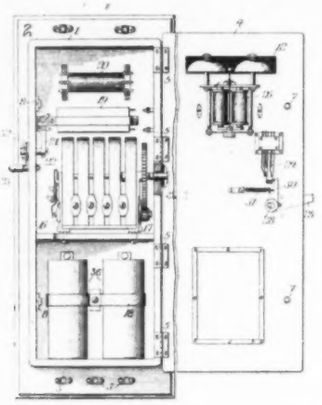
WEATHER PROOF TELEPHONE.

G. F. Atwood, East Orange, N. J., patent 897,866, Sept. 8, 1908.

This invention consists of a telephone cabinet, in which all parts are mounted, and all parts which must protrude from the cabinet are bushed, the prime object of the invention being to prevent access to the interior of the instrument of insects and moisture.

The ringer, 26, is mounted on the inside of the door, and the sound can issue from the cabinet by the grating 12, which has meshes of several different sizes. The switch-hook, 24, is actuated by the lever, 25, which projects through the door. On this lever, 25, a suitable combined transmitter and receiver can be hung. Inside the cabinet are likewise mounted the generator, whose shaft projects from the cabinet through

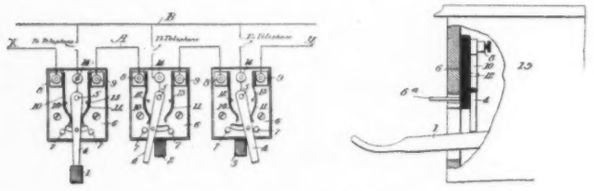
a bushed opening, a condenser, 19, and induction coil, 20. The wiring in the rear of the cabinet is protected by means of a false back, 2. A switch, 23, is shown, whereby it is possible to use the telephone either as a common battery or local battery instrument.



TELEPHONE SWITCH.

Clarence Truitt, Moscow, Ida., patent 897,681, Sept. 1, 1908.

This invention relates to switches for telephones, whereby the subscriber can cut out the section of the main line at either side of his station, so that the conversation being carried on by two subscribers cannot be heard by the other subscribers on the same line. In the illustration, the switch-hook 1 is held down by means of switch levers 4, which are mounted on an insulating plate 6, and are operated by means of a pin 6-*a*, projecting from the telephone case. The switch-hook 1 cannot be elevated unless the lever 4 is moved either to the right or left. Flat line springs 10 and 11 normally bear against opposite sides of the switch lever 4 and hold it in a vertical position. When the lever is turned in either direction, the spring on the opposite side is held out of contact, thereby breaking the main line circuit which normally passes through the springs 10 and 11 and the switch lever 4. A third binding post 14 is connected with the switch lever and through the telephone to the ground or second line. When the switch-hook is in its lower position and the lever 4 is held in its central position by means of the springs 10 and 11, the

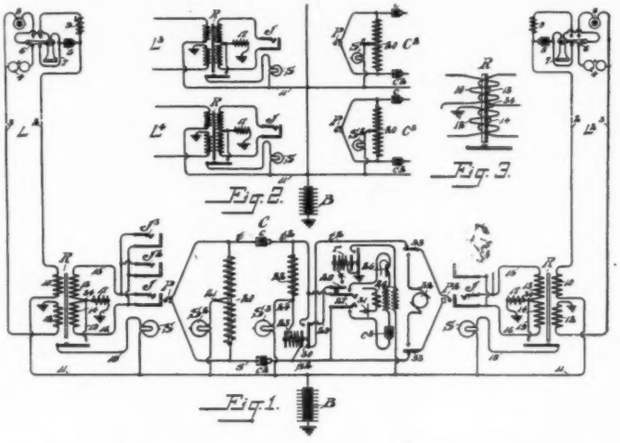


telephone circuit through the switching device is unbroken and telephone conversation can be carried on through this switching device.

TELEPHONE RINGING CIRCUIT.

W. W. Dean, Chicago, Ill., patent 897,723, Sept. 1, 1908.

This invention refers to a common battery telephone circuit, in which a relay under normal conditions controls the circuit of the line signal, and at other times, that is, when connections are established with the lines for conversation, the relays control the operation of the temporarily associated supervisory signals. When connection is established with a telephone line, the supervisory signal which is associated with the cord circuit employed for the connection is placed in parallel with the line signal of that line, and the adjustment and electrical dimensions for the various parts are such that when the subscriber's telephone is off its hook neither the line nor supervisory signal receive sufficient current to be operated. When the telephone of the subscriber is replaced upon its hook, sufficient current is permitted to flow through the supervisory to



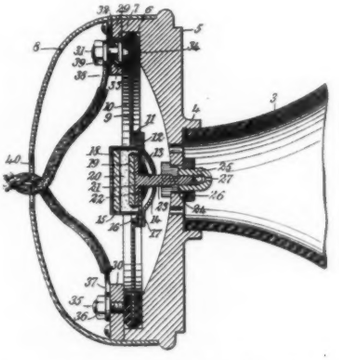
cause it to be operated. When the subscriber takes the receiver off the hook, of course sufficient current flows to illuminate the line lamp.

The novelty of this system resides in the fact that the talking wires are used for establishing these connections, thus doing away with extra wires which would ordinarily be used for this purpose in common battery switchboard wiring.

TRANSMITTER.

J. T. Curtis, Bement, Ill., patent 897,716, Sept. 1, 1908.

This patent covers a transmitter in which means are provided whereby an adjustment of the diaphragm tension can be made from the front of the transmitter without removing any portion of the transmitter from its mounting, or without disturbing the mouth-piece. The diaphragm 9 is mounted in the casting 5, and is suitably held, and carries one electrode 18. The other electrode, 19, is



firmly secured to a stem, 23, which is adjustably mounted in the casting 5, and by which adjustment can be effected, by means of the nut 25, to increase or decrease the tension between the electrodes.

TELEPHONE REPEATER.

H. E. Shreeve, Wyoming, N. J., patent 898,073, Sept. 8, 1908.

This apparatus consists of a receiving element provided with the customary permanent magnet and adjustable core. A reciprocating core projects into the receiver coil, and carries a gold-plated iron diaphragm, which presses against the carbon particles in the transmitter, the circuit through the transmitter being completed through a carbon electrode.

A feature of this invention is the provision of means whereby the expansion and contraction of the diaphragm

which is under the control of the receiver coil, and which actuates the carbon particles in the transmitter, is prevented from causing a buckling of the diaphragm. The part of the complete vibratory portion which is under the control of the receiver is mounted on the transmitter casing by means of a punched disk, and the central portion of this disk supports the gold-plated electrode, which is smaller than the inner diameter of the transmitter casing. All parts are thus allowed to expand without causing a buckling of any of them.

In the Manufacturing Field

Establishing a New Lumber Town.

The Goodman Lumber Company, with general offices at Marinette, Wis., is establishing new operating headquarters at Goodman, Wis., seventy miles west of Escanaba, on the "Soo" railroad. The company owns 60,000 acres of cedar, pine, hemlock and hardwood around there and has a particularly fine lot of cedar around Lake Hilbert from which it expects to obtain a fine lot of telephone poles this season. The company is building a two-story hotel, 100 x 130, at its new town of Goodman, and will shortly commence the erection of a mammoth mill, for which over $10,000 worth of belting alone will be required.

The American School of Correspondence, Chicago, Ill., has allotted a number of "wage-earners' scholarships" to be awarded by business men in various parts of the country. These scholarships are for the benefit of deserving young men who are unable to go away to school, and who cannot attend night school. They are good for a period of five years, that is, the recipient has five years in which to complete the course selected. The only expense in connection with these scholarships is the cost of text-books and postage. Such incidentals are not included in a scholarship in any school. The text-books are written especially for correspondence work by eminent teachers in the best technical schools and their value is shown by the fact that they are used in the class-rooms of many of the leading universities, such as Harvard, Lehigh, Columbia, Michigan, Illinois, Iowa State College and the Government School of Submarine Defense. Full information regarding the distribution of the scholarships may be obtained from the secretary of the school, Mr. O. C. Miller.

The American Conduit Company, 140 Nassau street, New York, is sending out a postal card relating to its bituminized fibre conduit. A photograph showing a workman preparing socket joint conduit for sealing is reproduced and the directions for making the joint are given. Reference is made to the other valuable bulletins regarding the laying of conduit which have been issued.

The Harvard Electric Co., 66 W. Van Buren St., Chicago, Ill., announces that although its main factory and stock were seriously damaged by a fire which occurred August 28, it is in a position to take care of all orders.

As the fire occurred late in the month practically all of the August orders had been shipped, and the company was not greatly inconvenienced, as it otherwise would have been.

The fire loss is estimated at $25,000, partially covered by insurance.

Plans have already been perfected for a larger and better equipped building than the one destroyed, which is to be ready for occupancy not later than November 1. A temporary factory has been secured and all orders will be promptly filled.

Orders in the Eastern territory will continue to be filled from the large stock of fuse wire, fuse links, telephone fuses, conduit boxes, sectional switch boxes, portable lamp guards, wire connectors, cleats, etc., carried by the Harvard Electric Company, 136 Liberty St., New York City.

Dean Equipment at the Minnesota Fair.

In addition to furnishing equipment for the large branch exchange operated by the Tri-State company at the Minnesota State Fair, the Dean Electric Company, of Elyria, Ohio, had a very attractive exhibit. As shown in the accompanying illus-

Dean Exhibit at the Minnesota State Fair.

tration, there were placed in the Dean company's booth a common battery private branch exchange switchboard, a magneto switchboard, and telephones for various classes of city, village and rural line service. The exhibit was in charge of Mr. W. S. Williams, state agent.

The F. Bissell Company, Toledo, Ohio, is sending out a unique card calendar for September. A small piece of sole leather in one corner calls attention to the fact that "It's for the sole" purpose of getting orders for some of the excellent electrical supplies and machinery always carried in stock by the Bissell company.

The Schuett Manufacturing Company, 17 West Madison street, Chicago, reports increasing sales of the Schuett self-welding wire joints. These connectors are claimed to be air-tight and moisture proof, forming a physical union with the wires which they connect. The company distributes interesting descriptive matter designed for telephone managers.

The Doubleday-Hill Electric Company, 919 Liberty street, Pittsburg, has elected W. D. Shaler to the office of secretary, to fill the place made vacant by the decease of his brother, H. G. Shaler.

The Cutler Hammer Manufacturing Company, of Milwaukee, Wis., has secured control of the National Battery Company, of Buffalo, N. Y. Under its new management, with all claims against it settled in full, and with ample capital for all requirements, the company is now fully prepared to furnish storage battery equipment promptly on all orders.

"TELEPHONE TOLL LINES AND THE CALCULAGRAPH" is the title of a booklet being distributed by the Dean Electric Company, Elyria, Ohio. It points out economy in the use of a calculagraph on toll lines and illustrates the types in common use. Illustrations of toll switchboards built by the Dean Electric Company and equipped with calculagraphs are given.

THE CHARLES DREGGE LUMBER COMPANY, of Grand Rapids, Mich., has been succeeded by the Dregge-Grover Lumber Company, and the business of the former company, in Michigan white cedar, will be continued and extended in both producing and wholesale ends. The new member of the company is H. P. Grover, of Grand Rapids, a cedar operator on quite an extensive scale in both the Upper and Lower Peninsulas for the past 15 years. The new company will operate extensively in cedar along the Soo and Duluth and South Shore lines, in addition to its hardwood operations elsewhere. General offices will remain in Grand Rapids with Messrs. Dregge and Grover in charge.

THE W. M. ABSHER COMPANY, North Wilkesboro, N. C., is making special prices on Southern pine, painted cross arms of various sizes, locust pins, painted oak pins and brackets. Shipment can be promptly made.

Condensed News Reports

Officers of companies are earnestly requested to forward us promptly all financial and other statements as soon as issued and any items of interest as to their plants and systems

PERSONAL.

MR. H. R. ROTHFUSS, of Loyalsock, Pa., has been elected secretary-manager of the Loyalsock Telephone Company.

MR. JAMES C. McDONALD has been appointed manager of the Schenectady Home Telephone Co., Schenectady, N. Y.

MR. W. E. WARD has been appointed manager of the Sheyenne Telephone Company of McVille, N. D.

MR. E. BURDICK has been elected manager of the Corn Belt Telephone Company's exchange in Maynard, Ia.

Mr. W. L. BURKE, of Troy, N. Y., has been appointed manager of the Jefferson County Telephone Company, with headquarters at Watertown, N. Y.

MR. C. A. HUTCHINGS, of College Hill, Kan., is the new manager of the Wareham-Wood Telephone Company, Junction City, Kan.

MR. L. S. SHOCKLEY, of Sparta, Tenn., has been appointed manager of the Gainesboro Telephone Company's exchange at Glasgow, Ky.

MR. A. H. GRAVES, of San Antonio, Tex., has moved to Sioux Falls, S. D., where he will take charge of the local exchange of the Northwestern Telephone Exchange.

MR. E. S. THOMPSON has been appointed manager of the Cumberland Telephone & Telegraph Company's exchange at Tallulah, La.

MR. A. F. OTTE, vice-president of the Fitzsimmons Independent Telephone Company of Cincinnati, Ohio, is the Independence Party candidate for governor of Ohio.

MR. J. W. CHERRY, of Sandusky, Ohio, has been appointed manager of the Paducah Home Telephone Company, Paducah, Ky., to succeed Mr. H. J. Jeffery, who has been elected general manager of the Paducah Pole & Timber Company.

MR. FRANK M. COZZENS, of Saratoga, N. Y., has been appointed district manager of the Hudson River Telephone Company at Schenectady, succeeding Harry W. Cohen, who has been promoted to the sub-license department of the company at Albany.

MR. H. D. CRITCHFIELD, of Milwaukee, President of the Wisconsin Independent Telephone Association, has offered his resignation as a director and voting trustee of the Telepost Company, of New York City. This resignation is to take effect immediately.

MR. W. G. BROREIN, president of the Peninsular Telephone Company, of Tampa, Fla., has been elected vice president of the newly-formed Tampa Publicity Club, which has for its object the boosting of Tampa. Tampans have been quick to recognize that no one has a closer touch on the business life of a city than a telephone executive.

NEW COMPANIES.

DENVER, COLO.—The Naturita Valley Rural Telephone Company of Coventry has been incorporated with a capital stock of $1500. The incorporators are: G. A. Akers, H. H. Ross, Henry Tamm, Roger L. Williams, George W. Hook, Arthur Priestley and K. B. Northrup.

ROANOKE, ILL.—The Roanoke Telephone Company has been incorporated with a capital stock of $2,000. The incorporators are: P. W. Kennell, C. W. Rediger and J. J. Beer, Jr.

ELWOOD, IND.—The farmers southwest of this city have organized a new telephone company. An exchange will be erected at New Lancaster. The new company will be known as the Madison, Hamilton and Tipton Counties Telephone Company. The president is Wm. Noland, and H. E. Hayworth is secretary.

BRONSON, MICH.—Articles of incorporation have been drawn for the Bronson Mutual Telephone Company with a capital stock of $10,000. The officers are: President, Ambrose Bushnell; vice-president, Frank Martin; secretary, J. E. Paulson, and treasurer, Dr. J. E. Ontwater; directors, Ambrose Bushnell, Frank Martin, Burnley Foote, Wm. Sutter, Fred Burghduff, and John Shaffmaster.

MEDINA, MINN.—The Central Telephone Company has been organized with a capital stock of $100,000. The officers of the new company are: President, W. J. Dwyer; vice-president, M. C. Dwyer; secretary, Katherine Dwyer. The new company will take over all the lines already built by Mr. Dwyer, and construct a number of extensions.

TRENTON, N. J.—The Billings Mutual Telephone Company, Jersey City, has been incorporated with a capital stock of $50,000. The incorporators are P. B. Moses, George M. Hays and J. Nevin Perry.

ALBANY, N. Y.—The Westchester County Automatic Telephone Company, of Yonkers, Westchester County, has been incorporated with a capital stock of $100,000. The directors are Frederick Hughes, Helen Degnon and Joseph L. Abrahams, all of Yonkers.

ALBANY, N. Y.—The Valatie Telephone Company has been incorporated to operate in Valatie, Kinderhook, Stuyvesant Falls, Rossman's, Stockport, Niverville, Chatham Center, North Chatham, Nassau, Schodack, Castleton and other places in Rensselaer and Columbia counties. The capital stock is $10,000. The directors are: Edwin D. Howe, Wilson Miller, Remus E. Lasher, and James Purcell, of Valatie; George McClellan, of Chatham; Sherman Van Ness, of Chatham Center, and George Murrell, of Syracuse.

SALEM, ORE.—Articles of incorporation have been filed by the Tillamook County Mutual Telephone Company with offices at Tillamook. The capital stock is $5000 and the incorporators are: R. Y. Blalock, J. D. Jones and L. F. Smith.

COOKEVILLE, TENN.—Home Telephone Company, incorporated by J. A. Isbell, J. I. Grisham, E. M. Pippen and others.

NASHVILLE, TENN.—The Home Telephone Company of Putnam County has been incorporated with a capital stock of $1500. The incorporators are: J. A. Isbell, J. I. Grisham, E. M. Pippin, W. T. Anderson and Lee Judd.

TRENTON, TENN.—J. W. Smith, C. F. Inman, T. Robinson, Chas. E. Adams, A. M. McRee, J. H. Harber and B. F. Lemond, all of Gibson county, in and near Eaton, Tenn., have applied for a charter for the Eaton Telephone Company.

TAMPICO, P. O. RUTLEDGE, TENN.—The Tampico Telephone Company, Grainger County, has been incorporated with a capital stock of $2,000 by Hal H. Mitchell, Walter E. Smith, Earl West, S. J. Lambdin, Clyde Hammer and J. L. Davis.

BELLO, P. O. WESTHOFF, TEX.—The Bello Telephone Company has been incorporated with Gustav Thieme, president; D. S. Pearce, vice-president; and Geo. C. Rehmet, secretary, treasurer and manager.

EAGLE PASS, TEX.—J. K. Wilson and E. T. Rucker are promoting the organization of a company with $30,000 capital stock to establish an Independent telephone system to give service in Eagle Pass.

OAKDALE, W. VA.—The Oakdale Telephone Company has been incorporated with a capital stock of $1000 by J. R. Boyd and others. The principal office will be at Oakdale, Mercer County.

ROBINSON, ILL.—The Southeastern Illinois Long Distance Telephone & Telegraph Company has increased its capital stock from $2,500 to $30,000.

ROCHESTER, N Y.—The payment of the last installment on the collateral trust notes of the United States Independent Telephone Company, which were floated two years ago, will be

made by the Rochester Trust & Safe Deposit Company on Sept. 17, when the notes become due. The issue was for $2,500,000, of which $1,750,000 has been paid, leaving $750,000 to be paid on the date named.

MAPLETON, WIS.—The Badger Telephone Company has issued new stock to the amount of $3,000. It is being offered to present stockholders and is being taken rapidly.

FRANCHISES.

WILLISTON, N. D.—George Wilson of this place has been granted a telephone franchise by the village of Stanley.

PRAIRIE CITY, IA.—The Four City Telephone Company has been granted a franchise in this place. The company will operate in Prairie City, Mitchellville, Altoona and Runnells, and connects with the Mutual Telephone Company of Des Moines.

HICKSVILLE, OHIO.—A franchise has been granted the Farmers' Mutual Telephone Company to operate in this village.

BRADY, TEX.—A franchise has been granted the Texas Telegraph and Telephone Company to operate a telephone system in Brady.

CONSTRUCTION.

TUSCON, ARIZ.—Telephone communication can now be had with Helvetia, as the line from Vails to Helvetia has been completed.

TUCSON, ARIZ.—The Arizona Overland Telephone Company now has its line in operation from Roosevelt to Fossil Creek, where it will be connected with the line from Flagstaff.

LOS ANGELES, CAL.—The Home Telephone & Telegraph Company has just completed the extensive construction work necessary to supply service in the southwest district, which is building up very rapidly. The installation of telephones will begin at once and rapidly pushed to completion. It is expected that all of the subscribers on the large waiting list will be connected up within the next thirty days.

MIDDLEPORT, ONT., CAN.—The Independent telephone system here will be in operation before the end of the month. James Douglas is manager.

PALMERSTON, ONT., CAN.—Material has arrived for the Hawthorn Hill Rural Telephone Company and construction work will be commenced immediately.

WALLACE, ONT., CAN.—The East Wallace Telephone Company's line is now completed from Listowel to Wallaceville.

WINNIPEG, MAN., CAN.—The Manitoba Telephone Commission has decided to erect a new central exchange at Portage la Prairie.

WINNIPEG, MAN., CAN.—The new telephone exchange being erected here by the Manitoba Telephone Commission will be completed by the end of this month.

CRESTED BUTTE, COL.—S. C. Mosher and S. R. Munson have been given a contract by the Crested Butte Telephone Company for 32 miles of extensions to its system.

DENVER, COL.—The Naturita Valley Rural Telephone Company of Coventry has been incorporated with a capital stock of

FT. WAYNE, IND.—The Commercial Telephone Company is overhauling its toll line between Warsaw and Wabash.

HERRIN, ILL.—A copper toll line is to be built from this place to Harrisburg by the Saline County Telephone Company. Work is to be started at once and the line is expected to be ready for service early in October.

SPRING VALLEY, ILL.—The Spring Valley Telephone Company is making many improvements to its system. Manager R. P. Hampton says two new lines will be constructed to La Salle in the near future.

ANDERSON, IND.—The Delaware and Madison Counties Telephone Company has a force of men at work overhauling its outside plant and installing a new switchboard. The improvements will cost about $15,000.

DUNLAP, IA.—Plans have been drawn for a one-story brick telephone building to cost $2,500.

HILLSDALE, IND.—The Hillsdale Telephone Company has ordered a 100 drop switchboard and construction material for thirteen miles of pole line.

MUNCIE, IND.—The Home Telephone Company, of Gastou, has its system completed and in operation.

FAIRFIELD, IA.—The Jefferson County Telephone Company is installing a new switchboard.

SIDNEY, IA.—J. W. Tilman is having the local telephone system overhauled and put in good condition. A new cable is being installed.

FT. SCOTT, KAN.—A new telephone line is to be constructed between this place and Pittsburg, work to be started at once.

WESTMORELAND, KAN.—About $300 will be spent by the Westmoreland Telephone Company on improvements to its system.

COLSON, KY.—The Carrs Fork Telephone Company is installing a six-line switch here, cutting out the Carrs Fork switch. It is preparing to begin immediate construction of a new line from Colson to Tillie, a distance of six miles, connecting with the line from Hazard. James Brown, Roxana, Ky., is manager.

GRADYVILLE, KY.—Work has been commenced on the construction of the new telephone line between this place and Columbia.

BRONSON, MICH.—The Bronson Mutual Telephone Company will begin the construction of its system in this place at once.

MILFORD, MICH.—The telephone instruments and switchboard of the Milford Home Telephone Company are now being installed.

MINNEAPOLIS, MINN.—The Tri-State Telephone & Telegraph Company has awarded the contract for a new East Side exchange building which is to be completed by December 1.

ROCHESTER, MICH.—The Michigan Central Railroad has run its telephone wires through this place. The telephone is to be used for train dispatching and it is reported that the line has been constructed through the Bay City Division.

DETROIT, MINN.—The Detroit Telephone Company is planning to construct rural telephones in the territory to the north of this city.

MESABA, MINN.—The Mesaba Telephone Company is building a toll line to Keewatin.

CHILLICOTHE, MO.—The People's Telephone Company are planning many improvements to its plant. A new building has been secured and a common battery system will be installed in place of the magneto system now in use.

CLARENCE, MO.—The new building of the Clarence Telephone Company has been completed and the switchboard will be installed at once.

INDEPENDENCE, MO.—The Home Telephone Company is installing an addition of 140 lines to its switchboard in this city.

MILES CITY, MONT.—Work has been completed on the construction of the telephone line between Miles City and Forsyth.

FORSYTH, MONT.—The work on the Rosebud Mutual Telephone line, which reaches from the Henry Bailey ranch, three miles from the Cheyenne Indian reservation, to Rosebud and Forsyth, has been completed. About 70 miles of wire and 2,000 poles were used in the construction. Over 30 ranches in the Rosebud valley are now in connection with Forsyth and Rosebud.

BELVIDERE, NEB.—The Thayer County Telephone Company is stringing cable in this place. About $1,500 will be spent in improving its system in this vicinity.

SPRINGVIEW, NEB.—The Exchange Telephone Company is constructing its system in this place and the switchboard will be installed within a short time.

CHATHAM, N. Y.—The Chatham Co-operative Telephone Company has completed a new line to Chatham Center, Maiden Bridge and North Chatham.

FORT PLAIN, N. Y.—New country lines will be built this fall by the Glen Telephone Company. The lines will extend from Fort Plain to Minden and Starkville.

CLEVELAND, N. D.—Many improvements to its system in this place are being made by the North Dakota Independent Telephone Company.

DICKENSON, N. D.—A new switchboard is being installed in the Independent telephone company's exchange.

EGELAND, N. D.—The Farmers' Telephone Company is planning extending its lines to the northeast for a distance of about twenty miles.

PERRYSBURG, OHIO.—A new toll board has been installed in the exchange of the Northern Ohio Telephone Company.

WOODWARD, OKLA.—The Home Enterprise Telephone Company will expend $20,000 in improving its system.

WOODWARD, OKLA.—The Home Enterprise Telephone Company is expending $20,000 in improving its system. A new switchboard is being installed.

ALLENTOWN, PA.—At a meeting of the stockholders of the Carbon Telephone Company, which operates an Independent line between Coal Dale and Summitt Hill, it was decided to improve the service by extending the line to Temaqua on the west and Nesquehoning on the east and connect at both places with the United Telephone & Telegraph Companies lines.

LOYALSOCK, PA.—The Loyalsock Telephone Company will build about five miles of new lines, principally in Gamble and Eldred townships.

DENISON, TEX.—The Grayson County Telephone Company is making arrangements to put in a new system here. It is stated that the contemplated improvements will cost $75,000.

CLINTWOOD, VA.—The Wise County Telephone & Telegraph Company is overhauling its lines and making other improvements. A line will be built from Clintwood to Coeburn, a distance of 13 miles. A new switchboard will be purchased for the Clintwood exchange. F. V. Vanover is the manager.

BURLINGTON, VT.—The directors of the Orange County Telephone Company have decided to build a trunk line from East Montpelier to Plainfield.

NORFOLK, VA.—The Planters' Telephone Company is extending its rural lines from Great Bridge to South Norfolk.

MALDEN, WASH.—The Malden Supply & Power Company has started construction of its telephone line to Rosalia. Work has also been started on the company's exchange building in this city. Thomas A. Bayliss is manager of the telephone department of the company.

KENOSHA, WIS.—The Kenosha Home Telephone Company is replacing its aerial wires in the business section of the city.

OCONOMOWOC, WIS.—The contract has been let for its new building at Mapleton by the Badger Telephone Company. The building, which is to be of concrete, is to be completed by November 17.

TOMA, WIS.—The Toma Telephone Company has constructed a line to Dorset Ridge.

CHEYENNE, WYO.—The water committee of the city council has been instructed to build a telephone line from this city to the Granite Springs reservoir and the site of the new Crystal Lake reservoir. The cost is not to exceed $1,000.

ELECTIONS.

AVON, ILL.—At the regular annual meeting of the Avon Mutual Telephone Company, Dr. S. S. Clayberg, G. C. Osborn, and Geo. E. Simmons, were re-elected for a three-year term. Arthur Merrill was also chosen a director vice Lester J. Ross, resigned.

BELVIDERE, ILL.—At a meeting of the stockholders of the Belvidere Telephone Company the following were elected directors: J. R. Balliet, F. S. Rowan, W. M. Marean, G. H. Grummon and O. F. Lucas. These were all re-elections excepting Mr. Grummon, who was elected in the place of M. C. Marean. The following were elected officers: President, J. R. Balliet; vice-president, F. S. Rowan; secretary, W. M. Marean, and treasurer, M. C. Marean.

LITCHFIELD, ILL.—The stockholders of the Montgomery County Telephone Company held their annual meeting in Hillsboro recently and elected directors for the ensuing year as follows: J. H. Ward, J. J. Frey, A. M. Howell, Mrs. Anna L. Carsteens and C. W. Bliss. The directors then met and organized as follows: President, C. W. Bliss; vice-president, J. H. Ward, secretaries, J. J. Frey and A. M. Howell.

WELLSVILLE, KAN.—A. T. Sheppard, M. W. Lidikay and Bailey Johnson have been elected directors, and C. C. Walters, auditor, of the Wellsville Co-Operative Telephone Association.

CLINTON, MO.—The Mutual Union Telephone Company has elected the following officers: Ed. Willoughby, president; J. M. Spangler, first vice-president; F. C. Livingston, second vice-president; G. W. Schweer, secretary and manager, and R. E. Majors, treasurer.

TARKIO, MO.—The following officers have been elected by the stockholders of the Atchison County Mutual Telephone Company: D. H. Kemmerling, president; Joe Hamilton, vice-president; Geo. H. Shandy, secretary, and John Robinson, treasurer.

TABLE ROCK, NEB.—At a recent meeting of the stockholders of the Table Rock Telephone Company, the following officers were elected for the ensuing year: President, Dr. G. G. Gandy; vice-president, F. A. Himmel; secretary and treasurer, O. J. Shrauge; manager, L. M. Billings.

PORTLAND, TENN.—At a meeting of the stockholders of the Sumner County Home Telephone Company the following officers were elected: R. D. Moore, president; F. L. Link, of Turner Station, vice-president; Bascom Simmons, secretary; directors, R. R. Moore, H. M. Moore, W. T. McGlothin, M. B. Perdue, J. W. Jones, G. W. Vouters, J. T. Durham, W. H. Mitchell, S. W. Brown and James Durham.

ENOSBURG FALLS, VT.—At a recent meeting of the directors of the Northern Telephone Company, the following officers were elected: President, W. S. Stevens; vice-president, M. P. Perley; secretary and general manager, E. H. Vancor of Morrisville; treasurer, C. L. Ovitt.

NORFOLK, VA.—The following have been elected officers of the Planters Telephone Company: President, J. E. Hall; secretary, L. L. Sawyer, and treasurer, J. Morse.

MISCELLANEOUS.

CONWAY, ARK.—J. A. Frisby, of Morrillton, has purchased the Conway Telephone Company, the consideration being $8,000.

MORRILTON, ARK.—E. J. and W. O. Massey have purchased a half interest in the Home Telephone Company's plant at Morrilton, the active management of which was assumed by E. J. Massey recently. The plant is now serving 270 patrons.

VIDALIA, GA.—The Vidalia Telephone Exchange has been sold to W. M. Denton and Z. W. Kirkland, of Douglas.

MATTOON, ILL.—The Farmington Mutual Telephone Company has been purchased by the Coles County Telephone & Telegraph Company.

IOWA CITY, IA.—John G. Sheetz, of Union township, has recently acquired the property of the Ed Hummer telephone lines between this city and the Iowa county line on the Williamsburg route. The company will hereafter be known as the Union Farmers' Mutual Company. Following are the officers: President, Louis Rohret; vice-president, Henry Rohret; secretary, John G. Sheeetz; treasurer, Nicholas Scheetz; board of directors, James Hogan, M. C. Rohret, William Hadrek.

JAMAICA, IA.—The Farmers' Mutual Telephone Company's exchange in this place was badly damaged by a recent fire.

LORRAINE, KAN.—The Lorraine telephone exchange has been transferred to the Ellsworth County Telephone Company by purchase. For several months past negotiations have been in progress, and were finally brought to a termination September 1, on which date the Ellsworth County Telephone Company took charge. Mr. Conrad Janssen, who owned the line, will remain in Lorraine and have charge of the exchange for the new owners.

CENTERVILLE, MD.—The Diamond State Telephone Company, with a branch here, has leased its telephone plant in Caroline, Talbot and Queen Anne counties to the Farmers' and Merchants' Telephone Company, H. M. Thompson, secretary.

GRAND RAPIDS, MICH.—The annual report of the Citizens' Telephone Company shows the company in a highly prosperous condition with an encouraging increase over last year. The total number of telephones in the Citizens' system is now 26,836, of which 9,375 are in this city. The number of city telephones increased 501 during the year. The company has paid regular quarterly dividends of 2 per cent out of the earnings and will continue to do so.

JACKSON, MISS.—It is announced that construction of the Home Telephone Company's system in this city will be commenced within a month. The line from Jackson to Meridian and Hattiesburg will also be built.

GRAND FORKS, N. D.—The Tri-State Telephone Company has purchased the Thief River Falls city exchange and the rural lines covering Greenbush, Roseau and Plummer, Minn. This gives the company 100 miles of rural territory. The service will immediately be increased and improved.

WEST ELKTON, OHIO.—The West Elkton Telephone Company has purchased the Bell exchange in this place and hereafter there will be but one telephone exchange here.

MARSHFIELD, ORE.—The Coos Bay Home Telephone Company, a new company which was recently organized by several local investors, has purchased the property of the old company which has been operating local and long-distance telephone lines in this and adjacent cities. The City Council of Marshfield has granted a new franchise, and the old one will be surrendered. Under the new franchise the company agrees to begin rebuilding the local exchange within 90 days and complete it within eighteen months. The franchise also provides for the payment of a 2 per cent franchise tax to the city when the population exceeds 30,000, and the placing of the wires underground in the business section when the city's population reaches 20,000.

BANCROFT, S. D.—George W. Brown has purchased the Bancroft telephone exchange from the Bancroft Telephone Company.

NASHVILLE, TENN.—The statement made last week in the pages of this paper that the Illinois Central Railroad has completed a telephone line between Memphis and Louisville was incorrect in that the line was put up by the Cumberland Telephone & Telegraph Company on its poles, as that company has a contract with the railroad company to furnish service. This railroad company is coming to a full realization of the importance of the telephone in providing efficient means for the transaction of business formerly done by telegraph, and in the future is expected to announce important projects for train dispatching by telephone.

ITALY, TEX.—On account of a proposed raise by the Southwestern Telephone & Telegraph Company of all telephones in business houses, the business men had their telephones cut out. Business men declare they will not stand the raise from $2 to $2.50 per month, hence their action.

ENOSBURG FALLS, VT.—The Northern Telephone Company of this place has purchased a controlling interest in the Citizens' Telephone Company, whose headquarters are in Morrisville and which operates five exchanges, in Morrisville, Hardwick, Stowe, Jeffersonville and Johnson covers fourteen towns in Lamoille and adjacent counties with 800 telephones. This deal brings under the control of the Northern Telephone Company's interests, the three important lines known as the Northern Telephone Company, the Central Telephone Company and the Citizens' Telephone Company, covering 32 towns with 1,900 telephones in use.

MT. PLEASANT, UTAH.—A committee has been appointed by the Commercial Club to look into the matter of forming an Independent telephone company.

REVELSTOKE, B. C., CAN.—The exchange of the Revelstoke & Trout Lake Telephone Company here has been completely destroyed by fire.

WINNIPEG, MAN., CAN.—According to officials of the Manitoba Government Telephone Commission scarcity of poles and materials, as well as a scarcity of linemen, is retarding construction on the government long distance telephone lines.

WINNIPEG, MAN., CAN.—The Manitoba Telephone Commission has opened long distance telephone offices at Pipestone, Sinclair and Reston. Others will be opened shortly at Dugold, Lorette, St. Anne, Steinbach, Niverville, Carey, St. Pierre, St. Malo, Somerset, Altamont, Swan Lake, Mariapolis, Greenway, Newdale, Strathclair, Kelloe and Solsgirth.

ROME, ITALY.—The Italian Minister of Posts, Telegraphs and Telephones, in view of the immediate increase in the telephone service here, has decided to study the best American systems with the object of introducing them into the peninsula. To this effect he has just sent Cavaliere Alberto Farunda, Director of Telephones in Rome, to the United States with the mission of studying especially the systems in New York and Chicago.

UNDERGROUND.

PLANT CITY, FLA.—The Peninsular Telephone Company, of Tampa, Fla., is about to place its telephone wires in this city underground.

GRAND LEDGE, MICH.—The wires of the Grand Ledge Telephone Company are being placed underground in certain sections of the city.

HORNELL, N. Y.—The Hornellsville Telephone Company has begun the work of installing its underground conduit system in this city.

MIDDLETOWN, N. Y.—The Orange County Telephone Company has applied to the common council for permission to lay conduits in the streets of this city for the purpose of placing its wires underground.

GRAND FORKS, N. D.—The Northwestern Telephone Company is laying its wires underground. The improvements will cost about $5,000.

Samuel G. McMeen — Kempster B. Miller

McMeen & Miller

Telephone Engineers
Plans, Estimates, Evaluations, Reports
Consultation Supervision

1454-1458 Monadnock Block . . . . . CHICAGO
787 Market Street . . . . . SAN FRANCISCO

Samuel G. McMeen — Kempster B. Miller

McMeen & Miller

Patent Solicitors and Patent Experts

In connection with our telephone engineering practice we make a specialty of securing electrical patents for inventors, and of giving expert advice in patent matters. We also have facilities for marketing meritorious inventions.

1454-1458 Monadnock Block . . . . . CHICAGO
787 Market Street . . . . . SAN FRANCISCO

W. H. CRUMB & COMPANY

Engineers : : Contractors

Telephone Engineering and Construction
Plans, Specifications and Estimates Promptly Furnished

835 Monadnock Bldg., Chicago, Ill.

JONES & WINTER

INDEPENDENT

Telephone Engineers and Contractors

1259 Monadnock Building, CHICAGO, ILL.

Write for Our References

H. A. JOHANN — O. R. JOHANN

JOHANN & JOHANN

Cable Experts
Installers of Switchboards and Cable Apparatus

COMPLETE EXCHANGE CONSTRUCTION

We positively guarantee all work to be of the highest order. None but skilled workmen employed. Write us for information. Cable trouble earnestly solicited.

PLANS, SPECIFICATIONS and ESTIMATES FURNISHED

PEKIN, ILLINOIS

JOHN STONE — W. S. GREEN

STONE & GREEN

Telephone Exchange Contractors and Engineers
1361 Monadnock Bldg., Chicago

We do all kinds of Telephone Engineering and Construction Work
Correspondence Invited.

FRANK F. FOWLE

Consulting Electrical and Telephone Engineer

Estimates, Plans and Specifications; Valuation of Properties and Investigation of Operating Conditions, Rates, Earning Capacity, Depreciation, Future Development, etc.

MARQUETTE BUILDING
204 DEARBORN STREET — CHICAGO 2

D. C. & WM. B. JACKSON

MEMBERS AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
AMERICAN SOCIETY OF MECHANICAL ENGINEERS
AMERICAN SOCIETY OF CIVIL ENGINEERS

ENGINEERS — EXPERTS

CHICAGO — BOSTON

EDMUND LAND

Telephone Engineer

Telephone Development Studies. Preliminary Reports and Estimates, Working Plans and Specifications, Appraisals, Etc.
Exchange Construction and Supervision.

No. 15 Jones Building DETROIT, MICHIGAN
Correspondence Solicited

WALTER C. POLK

TELEPHONE CONSTRUCTION ENGINEER

PLANS, ESTIMATES AND REPORTS
SPECIFICATIONS AND SUPERVISION

742 Ohio Building — TOLEDO, O.

J. W. MIDDLETON & CO.

TELEPHONE STOCK CERTIFICATES
NEW ELEGANT STEEL VIGNETTES

Publishers of **Inter-State Corporation Record** containing all Forms and Blanks for Organizing a New Corporation

Stock Certificates, Bonds, Corporate and Notarial Seals, Blank Books, Printing, Lithographing

167-169 DEARBORN STREET :: :: CHICAGO

PATENTS, TRADE MARKS, COPYRIGHTS

MAX W. ZABEL

PATENT ATTORNEY

Associate Member American Institute of Electrical Engineers
Expert Opinions, Investigations, Consultations

260 Dearborn St., Chicago, Ill.

TELEPHONE EAR CUSHION Cuts Off All Outside Noises

Samples FORTY CENTS, Prepaid

This pneumatic cushion is made of the softest rubber and can be adjusted to the hard gutta-percha receiver very readily. The cushion conforms to the exact shape of the ear as such an air pad alone could, cutting off outside noises and giving the ear a comfortable cushion instead of a rigid receiver. Holds the ear-drum further from the receiver, and by virtue of the air and flabby rubber cushion it neutralizes the harsh crash! crash! noises. Made by

HURON RUBBER COMPANY, CLEVELAND, O.

We have on hand newly manufactured, guaranteed apparatus of all makes

Telephones, Switchboards and Supplies

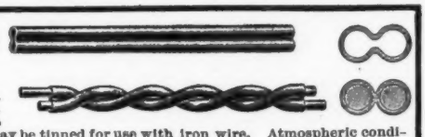
which we can sell to you at a reduction of 40% to 50% in price. Write us to-day

We rebuild all kinds of telephone apparatus. Make it as good as new Consult our repair department.

Missouri Valley Telephone & Electrical Construction Co.

123-25 West 6th St., Kansas City, Mo.

H.-C. Seamless Tubular Wire Connectors

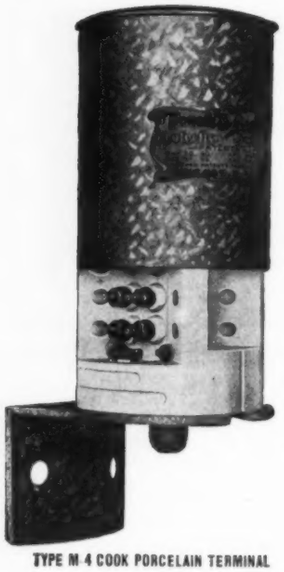


make a perfect self-welding joint. They are seamless and are drawn up from sheet copper and may be tinned for use with iron wire. Atmospheric conditions cannot impair their efficiency. Write for price lists.

HOLTZER-CABOT ELECTRIC CO.

Factory: Brookline, Mass. — 395 Dearborn St., Chicago, Ill.

COOK TERMINALS and JUNCTION BOXES



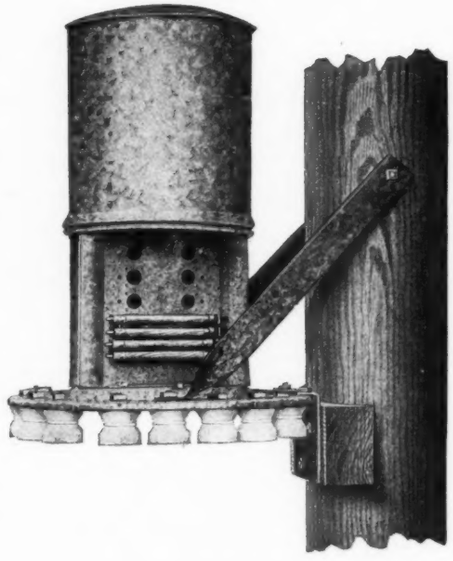
TYPE M 4 COOK PORCELAIN TERMINAL

Nothing could be better adapted to real, practical service than Cook Specialties.

They have made good in every case.

Why not write for details? It's worth while.

Frank B. Cook
MANUFACTURER
of TELEPHONE PROTECTIVE APPARATUS
CHICAGO ILLINOIS
242 WEST LAKE STREET



TYPE T-21 COOK ALL STEEL TERMINAL

Alphabetical Index to Advertisers

Abrahams & Co. ... 18
American Circular Loom Co. ... 3
American Elec. Fuse Co. ... 10
American Elec. Telo. Co. ... 28
American Electrical Works ... 28
American School of Correspondence ... 23
American Steel & Wire Co. ... 21
American Wood Preserving Co. ... 18
Andrae & Sons Co., Julius ... 8
Automatic Electric Co. ... 13
Baird Mfg. Co. ... 12
Baker & Co. ... 1
Beidler & Co., Francis ... 25
Belden Mfg. Co. ... 10
Blake Signal & Mfg. Co. ... 12
Brixey, W. R. ... 1
Brooks, Hall ... 24
Central Electric Co. ... 3
Central Telo. & Elec. Co. ... 16
Chance Mfg. Co. ... 16
Chicago Telo. Supply Co. ... 1
Clay Product Co. ... 1
Commercial Elec. Supply Co. ... 22
Connecticut Telo. & Elec. Co. ... 18
Cook, Frank B. ... 14-20
Cracraft, Leich Elec. Mfg. Co. ... 6
Crumb & Co., W. H. ... 19
Dean Electric Co. ... 7
Detroit Insulated Wire Co. ... 1
Doty Lumber & Shingle Co. ... 26
Duluth Log Co. ... 24
Duplex Metals Co. ... 2
Ericsson Telo. Mfg. Co., L. M. ... 9
Fahnestock Electric Co. ... 28
Faris & Mayhew Lbr. & Pole Co. ... 24
Fisher Stevens Co. ... 14
Fowle, Frank F. ... 19
Frankel Display Fixture Co. ... 18
French Battery & Carbon Co. ... 27
Gray Telo. Pay Station Co. ... 12
Hallett Iron Works ... 14
Harding, Geo. ... 24
Holt Lumber Co. ... 26
Holtzer-Cabot Elec. Co. ... 19-23
Huebel Co., C. J. ... 24
Huron Rubber Co. ... 19
Indiana Rubber & Ins. Wire Co. ... 2
Itasca Cedar Co. ... 24
Iwan Bros. ... 27
Jackson, D. C., & Wm. B. ... 19
Johann & Johann ... 19
Jones & Winter ... 19
Klein & Son, Mathias ... 28
Land, Edmund ... 19
Leeds & Northrup Co. ... 2
Lindsley Bros. Co. ... 24
Long Distance Telo. Mfg. Co. ... 8
Mansbridge, G. F. ... 28
Matthews, W. N. & Bros. ... 27
McMeen & Miller ... 19
McRoy Clay Works ... 1
Middleton, J. W. ... 19
Miller Anchor Co. ... 18
Milwaukee Elec. Specialties Co. ... 28
Minnesota Elec. Co. ... 16
Missouri Valley Telo. & Electrical Construction Co. ... 21
Monarch Telo. Mfg. Co. ... 6
Mountain State Electrical Co. ... 4
Nash & Co., Geo. ... 22
National India Rubber Co. ... 28
National Pole Co. ... 25
North Electric Co. ... 8
Okonite Co., Ltd., The ... 1
Page & Hill Co. ... 26
Peirce Specialty Co. ... 2-18-28
Pendleton & Gilkey ... 24
Pignolet, Louis M. ... 18
Polk, W. C. ... 19
Protective Elec. Supply Co. ... 14
Roberts Telo. Co., Homer ... 12
Roebling & Sons, John A. ... 10
Runzel Lenz Elec. Mfg. Co. ... 3
Schwarze Electric Co. ... 28
Seymour Mfg. Co. ... 28
Simplex Electrical Co. ... 28
Specialty Sales Co. ... 22
Standard Telo. Mfg. Co. ... 4
Sterling & Son, W. C. ... 26
Sterling Electric Co. ... 17
Stevens, Chas. G. ... 1
Stone & Green ... 19
Stromberg-Carlson Telo. Mfg. Co. ... 5
Sumter Telo. Mfg. Co. ... 4
Swedish-American Telo. Mfg. Co. ... 15
Telephone Appliance Co. ... 27
Telephone Printing Co. ... 2
United States Coin Reg. Co. ... 27
Universal Specialty Co. ... 22
Valentine-Clark Co. ... 26
Want Advertisements ... 26
Waterbury Co. ... 1
Wesco Supply Co. ... 11
Western Lbr. & Pole Co. ... 26
Weston Electrical Inst. Co. ... 18
Williams Test Clamp Co. ... 2
Worcester Co., C. H. ... 25
Wyckoff Pipe & Creosoting Co. ... 24
Yonkers Specialty Co. ... 1
Zabel, Max W. ... 19

American Steel & Wire Company's

W. & M. Telephone Wire

IS made of materials selected and tested in all the stages from our own mines to the finished product. The employment of specially adapted metals is of greater importance in telephone wires, because not alone must tensile strength be considered, but electrical conductivity as well. To attain both these and in addition apply a quality of galvanizing that will effectually protect against weather conditions, is a triumph of the wiremaker's art. It is accomplished only with the greatest facilities for manufacture and an organization trained to the highest standard of excellence. Our brands illustrated below represent the best that experience, skill, facilities and hard and painstaking study can produce.

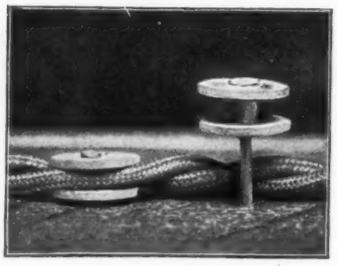
Chicago New York **AMERICAN STEEL & WIRE COMPANY** Denver San Francisco

Eureka Fibre Insulators

A NEW STYLE

"PRICES TO POINT, WHERE IT IS ECONOMY TO USE THEM"

The value is in the method that they are attached without injury to the wire

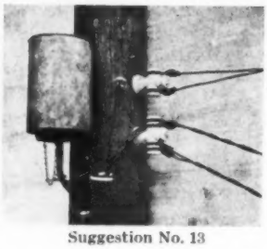


Made in Three Types
50, 60, 70
¾", ⅞" and 1" long respectively

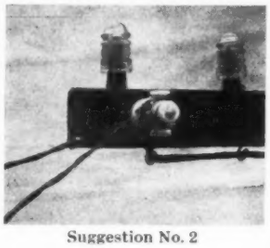
PRICES AND SAMPLES ON APPLICATION

Commercial Electrical Supply Co.

Fifteenth and Pine Streets ∴ ∴ ST. LOUIS, MO.



Suggestion No. 13



Suggestion No. 2

Universal Insulators

SOME ADVANTAGES:

A Separate Groove for Each Wire—Grooves for Any Direction—Universal—All Porcelain—Will Not Rot or Rust—Prevents Damage to Twisted Pair Wires—Reduces Maintenance.

Write for Descriptive Literature

Universal Specialty Company

116 S. Seventh St. Terre Haute, Ind.

Suggestion No. 5

Suggestion No. 8

We Carry for Immediate Shipment

Capital High Speed Steel	Oil Tempered Wire
Capital High Speed Twist Drills	Music Wire
Eagle & Globe Tool and Die Steel	Tinned Wire
Solar Tool Steel	Cast Steel Binding Wire
Self Hardening Steel	Acme Resistance Wire
Forged Die Blocks	Coppered Bessemer Rods
Spring Steel Sheets	Cold Rolled Shafting
Crucible Cold Rolled Steel	Cold Drawn Screw Rods
Hardened and Tempered Strips	Cold Drawn Shapes
Drill Rods	Cold Drawn Norway Iron
Dental Octagons	Cold Rolled Flat Wire
Roller Bearing Rods	Coiled Springs

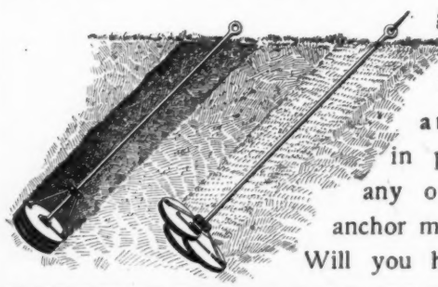
Send for Catalogue of Nash Salt Bath Tempering Furnace and our Steel Catalogue

GEO. NASH CO.

New York, 217 Pearl St. Chicago, 115 W. Washington St.

Cold Rolled Drawing and Stamping Steel

The "EVERSTICK"



guy anchor is higher in efficiency and lower in price than any other guy anchor made. Will you have proof?

SPECIALTY SALES COMPANY

Cedar Rapids, Iowa

H. C. Vibrating Howler and Busy-Back

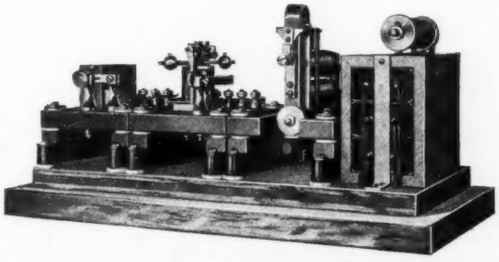
THE PAST ART—In Telephone Exchanges having motor driven ringing apparatus, the howler and busy-back is attached to these ringing machines, and consist of segmented rings to interrupt the current in order to obtain the required signals. When multicycle vibrating converters or any form of pole changers are also installed for auxiliary or permanent use, no form of howler and busy-back excepting the motor driven type has heretofore been available.

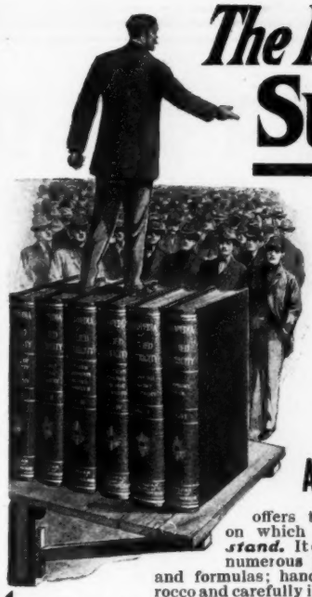
THE PRESENT ART—We now offer to Telephone Exchanges the H. C. Vibrating Howler and Busy-Back which operates from either 10 or 20 cells of storage batteries or from dry cells. The apparatus was designed and developed for efficiency, durability and flexibility. It consumes only 4.6 Watts, requires practically no attention. The howler can be adjusted to any pitch, and the busy-back can be set for any tone and periodicity. It is a money saver, a great convenience, a truly new and novel invention.

CONSTRUCTION—The individual parts are mounted on slate and the units securely fastened to an oak base. All parts are completely wired. A cover with a glass top protects it from dust or injury, but still admits of its operation being seen.

USE—If you are in need of a howler and busy-back when your ringing machine is shut down or desire one for auxiliary work, kindly write us.

The Holtzer-Cabot Electric Co.
395 Dearborn St., CHICAGO, ILL.
BROOKLINE, MASS.





The Platform of Success

Knowledge is the Platform of Success

A good, strong, educational platform is as essential to the business man, professional man or trade worker who aspires to success as the political platform is to the presidential candidate. The **new SIX VOLUME edition** of the

CYCLOPEDIA OF Applied Electricity

offers the electrical worker a **platform** on which he can make a ***successful stand.*** It contains 3,000 pages, 7x10 inches; numerous illustrations, diagrams, tables and formulas; handsomely bound in half red morocco and carefully indexed for ready reference.

Electricity is the life blood of the telephone. Inventors may do away with "hello girls" and wires, but they cannot telephone without electricity. Every new invention and improvement is only a further application of electricity. The telephone man who wants to get on in his profession must understand electricity thoroughly, so that he can handle the most delicate instruments and complicated appliances. You can get the latest information, in the most understandable form, from these books. They were written for practical men by practical men; they will tell you just what you want to know to get a start in telephone work, or post you on the latest progress in automatic and wireless telephony.

The Cyclopedia will tell you what you want to know in a way that you can understand. It covers the latest electrical discoveries and appliances as thoroughly and practically as it does the elementary subjects. It makes the **student** an expert; gives the **expert** knowledge that will broaden his field; enables the **worker** to get and hold a better job; shows the **inventor** in which direction his ability is most needed. Whether you are interested in appliances of proved value, such as the standard motors and generators, or in new inventions like the single-phase railway and wireless telephony, you can learn all about it from the Cyclopedia.

To introduce our correspondence courses, from which the Cyclopedia was compiled, we make this special 30-day offer.

$18.00 Special Price **Regular Price $36.00**

Absolutely FREE for 5 days' examination. Sent express prepaid, on receipt of Coupon. If you want the books pay us $2 within 5 days and $2 a month until you have paid the special price of $18; otherwise return them at our expense. **We sell direct at lowest prices.**

BRIEF LIST OF CONTENTS

Telephony, including Instruments, Lines, Exchanges, Common Battery Systems, Operation, Maintenance; Automatic Telephone; Wireless Telephony; Telegraphone, etc.

Theory, Calculation, Design and Construction of Generators and Motors; Types of Dynamos and Motors; Elevators; Direct-Current Motors; Electrical Measurements; Electric Lighting, including Arc and Incandescent Lighting, Nernst Lamp, Cooper-Hewitt Lamp, Osmium Lamp, etc.; Electric Railways, including Third-Rail System, Multiple-Unit Control, Electro-Pneumatic Control; Alternating-Current Motors, etc.; Single-Phase Electric Railway; Electric Welding; Mercury Vapor Converter; Management of Dynamos and Motors, including the Location and Remedy of Troubles, such as Sparking at the Commutator, Heating, etc.; Power Stations; Central Station Engineering; Central Station Design; Storage Batteries, including Charging and Discharging, Troubles and Their Remedies, Tests for Impurities, etc.; Power Transmission, Alternating-Current Generator, Synchronous Motor, Induction Motor, Transformer, Rotary Converter, Frequency Changer, etc.; Electric Wiring; Electric Telegraph; Wireless Telegraphy; the Telautograph.

AMERICAN SCHOOL of CORRESPONDENCE
CHICAGO

COUPON Clip and Mail to-day

American School of Correspondence, Chicago: Telephony, 9-19-08

Please send Cyclopedia of Applied Electricity for FREE examination. I will send $2.00 within five days and $2.00 a month until I have paid $18.00; otherwise I will notify you to send for the books. Title not to pass until fully paid.

Name .....

Address .....

Occupation .....

Employer .....

Evidence of our ability to meet all trade demands:

New customers constantly coming our way

POLES

We have the "goods" and the facilities for supplying you promptly at right prices.

Duluth Log Company

General Offices: Second Floor, Palladio Bldg.
Duluth, Minnesota

WESTERN CEDAR POLES AND RED FIR CROSS ARMS

THE LINDSLEY BROTHERS COMPANY, SPOKANE, WASH.

EASTERN SALES OFFICE
MONADNOCK BLOCK, CHICAGO, ILL.

WE PRODUCE OUR OWN POLES AND MANUFACTURE OUR CROSS BARS

C. J. HUEBEL COMPANY
Room 2, Schale Block, Menominee, Mich.

Michigan White Cedar Poles

Idaho Cedar Poles—all Lengths

Yards: Menominee, Mich.; Nathan, Mich.; Stager, Mich.; Swanson, Mich.

WHITE CEDAR POLES

Buy from the Producers and Save Jobbers' Profits

PENDLETON & GILKEY - Minneapolis, Minn.

POLES WESTERN RED AND MICHIGAN WHITE CEDAR

LONG POLES A SPECIALTY

FARIS & MAYHEW LUMBER & POLE CO.

202 & 203 Continental Building, Denver, Colo.

POLES

NORTHERN WHITE CEDAR

Give best service. Our prices are lowest. May we quote?

ITASCA CEDAR COMPANY. Deer River, Minn.

The Wyckoff Pipe and Creosoting Co., Inc.
(Established 1881)
Manufacturers and Dealers in

CREOSOTED WOOD

Conduits for Underground Wires and Cables, Cross Arms, Poles, Guy Blocks and Lumber

Wood treated by our dead oil of coal tar process will never decay.

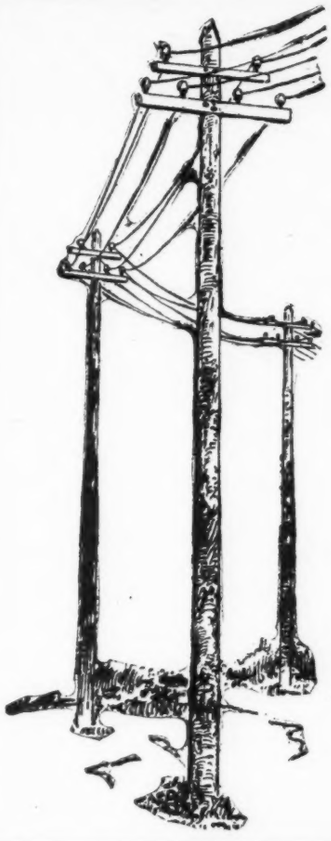
Office: 50 Church St., N.Y. City Works: Portsmouth, Va.

CEDAR POLES

HALL BROOKS TOMAHAWK, WIS.

Complete Stock All Sizes **WHITE CEDAR POLES**

Get my prices before buying GEO. HARDING, Deer River, Minn.



National Pole Company

Escanaba, Michigan

Successor to the Cedar Department of the

PITTSBURG & LAKE SUPERIOR IRON CO.

Producers and Shippers of

CEDAR POLES

From the Stump to the Line

We carry large stocks of Poles at various points in the States of Michigan, Wisconsin, Minnesota, Idaho, Washington and Maine, and are in position to make immediate shipments at lowest prices and freight rates.

Cedar Poles

LARGE BUTTS

We cut poles from lands owned by our Company in Northern Michigan on Lake Superior Shore, where the cedar is very **sound** and **stocky** with **heavy butts.**

All sizes in stock all the year round.

Write for a Copy of Our Telegraph Code for Cedar Products Giving Valuable Information About Poles.

C. H. WORCESTER CO.

1708-1710-1712 Tribune Bldg.

CHICAGO, ILL., U. S. A.

White Cedar

POLES

POLES

LARGE STOCK—14 to 65 ft.

Prompt Shipment

FRANCIS BEIDLER & CO.

CHICAGO, ILL.

YARDS:

Marinette, Wis. Escanaba, Mich. Superior, Wis.

DOTY LUMBER AND SHINGLE CO.

Manufacturers of

Washington Fir
Cross Arms. Red
Cedar Poles and Piling
In any Length
PROMPT SHIPMENTS
Doty, Washington

WE MAKE LOW PRICES ON

Idaho Red Cedar Poles

Michigan White Cedar Poles

8 YARDS IN IDAHO—2 IN MICHIGAN

Western Lumber & Pole Co.

Main Office Charles Bldg., Denver, Colo.

No. 5

Idaho Cedar Poles

20 to 80 ft.

in our Minnesota Transfer and Newport Idaho Yards

GET OUR PRICES

Page & Hill Co.

Minneapolis, Minn.

The Valentine-Clark Co.

ERNEST L. CLARK, President

Michigan / Western } Cedar Poles Exclusively

All stock concentrated in our main yards

Minn. Transfer, Minn. — Green Bay, Wis.
Prentice, Wis. — Pinconning, Mich.

MAIN OFFICE

234 La Salle Street — Chicago, Ills.

CLASSIFIED ADVERTISEMENTS

And want advertisements not exceeding twenty words, exclusive of address, will be inserted in these columns for $1.00 each. For over twenty words, the rate will be 5 cents per word.

WANTED—Position as wire chief or troubleman; 7 years' experience on magneto and central energy systems. Age 25. A 1 references. Address No. 514, care TELEPHONY.

WANTED—Manager with several years' experience in engineering, installation, construction, inspection and traffic work wishes to make a change. East preferred. Can get business. Address No. 510, care TELEPHONY.

WANTED—To buy a small telephone exchange. Give full information in first letter. W. M. McCoy, 5473 Lexington Ave., Chicago, Ill.

WANTED—To lease a telephone plant; not less than two hundred or more than one thousand subscribers; practical man, mature years; gilt edge reference. Address No. 512, care

POSITION WANTED—As switchboard man or manager of central energy exchange. Any territory. Technical graduate. Best references. Address No. 511, care TELEPHONY.

FOR SALE—The whole or half interest and 3 small exchanges, consisting of several hundred telephones and 300 miles toll lines. Good paying telephone property, located in the South. Owner has not the time to look after it. Address T., care TELEPHONY.

FOR SALE—Telephone exchange in a good town in Northern Nebraska. Will sell at a bargain. Good reason for selling. W. H. Williams, Ainsworth, Nebr.

Capital to invest with service in any telephone company in east or central west; 17 years' experience. Address No. 513, care TELEPHONY.

CHEMICAL ENGRAVED NAME PLATES and drop numbers. Steel stamped letters and figures: Send for samples and prices. C. H. Hanson, 44 Clark St., Chicago.

WASHER'S "SPECIAL SIZES."—In any quantity, metal or fibre. We also make dies, do all kinds of stamping, screw machine work and light machine work. Quadriga Mfg. Co., 16-18 So. Canal St., Chicago, Ill.

Michigan White Cedar POLES

WILL OUTLAST ALL OTHER KINDS

GET OUR PANIC PRICES. We can fill all sized orders from our own stock 150,000 ON HAND. Twenty-eight years have we been producers.

W. C. STERLING & SON CO.

Principal Office: MONROE, MICHIGAN

Yards: Bay City, Omer, Boyne Falls, Cass City and Monroe

White Cedar Poles

2900	Pieces	4"	16'	2500	Pieces	5"	25'	240	Pieces	7"	40'
300	"	5"	16'	2200	"	6"	25'	20	"	8"	40'
200	"	6"	16'	200	"	7"	25'	7	"	6"	45'
1800	"	4"	18'	150	"	5"	30'	64	"	7"	45'
150	"	5"	18'	1900	"	6"	30'	8	"	8"	45'
100	"	6"	18'	800	"	7"	30'	4	"	6"	50'
800	"	4"	20'	50	"	8"	30'	14	"	7"	50'
1900	"	5"	20'	450	"	6"	35'	5	"	8"	50'
450	"	6"	20'	530	"	7"	35'	1	"	7"	55'
150	"	7"	20'	45	"	8"	35'	1	"	7"	65'
3000	"	4"	25'	70	"	6"	40'	Write for Delivered Prices			

HOLT LUMBER CO., Oconto, Wis.

CHICAGO OFFICE: 315 DEARBORN ST.

STOCKS AT

Mountain, Wis., C. & N. W. Ry. Bruce's Crossing, Mich., D. S. S. & A. Ry. Oconto, Wis., C. & N. W.; and C. M. & St. P. Ry.

The Cost of Digging

pole and anchor holes goes down to minimum when the

Iwan Post Hole Auger

is used. In every kind of earth, except solid rock, it does the work easier and quicker than any other tool yet devised for the purpose.

Our booklet, "Easy Digging", contains valuable information. Write for a copy.

IWAN BROTHERS
STREATOR, ILL.

Matthews.' Matthews.' Matthews.' Matthews.' Matthews.'

Matthews' Cable Rollers

(Formerly called Callahan)
(Patent Applied For)

They will save their cost every time they are used to put up 5,000 feet of lead covered cable.

They have no sharp edges to injure cable sheath; no bolts or nuts to work. They can be clamped on the messenger immediately.

W. N. MATTHEWS & BROTHER
Manufacturers of Matthews' Patented Money Saving Specialties
218 N. 2nd Street, :: :: ST. LOUIS
If it is made by Matthews it must be a Money Saver

Matthews.' Matthews.' Matthews.' Matthews.' Matthews.'

$1.00 YANKEE POLE SEATS

Made of 1½-in. angle iron painted with a weather-proof asphalt paint, to which is bolted a 1-in. seasoned, creosoted pine seat

STRONG—DURABLE—CHEAP

Other specialties described in our bulletin may be had for the asking.

THE TELEPHONE APPLIANCE CO.
MINNEAPOLIS, MINN.

10,000 Telephone Conversations in a DRY CELL

if they don't leak out on shelf wear. Shelf-wear is all-important to the telephone manager, and in solving this problem he has the co-operation of the

French Battery & Carbon Co.
(Makers of the "Fleur de Lis" Dry Cell)
MADISON, WIS.

U. S. COMBINED

CASH REGISTER and PAY STATION

GIVE THE BEST SERVICE

Single Gong only — A Cash Ticket with every collection

NO ERRORS — CASH ACCOUNTED FOR

The United States Coin Register Co.

MONROE, MICH.

American Electric Telephone Co., Chicago

WE ISSUE THE FOLLOWING BULLETINS AND CATALOGUES

Bulletin No. 10—American Express Switchboards.
" " 11—Desks—Toll and Private Branch.
" " 12—Visual Signal and Bell Style Switchboards.
" " 13—Intercommunicating Systems.
" " 14—Line Material and Supplies.
" " 15—Bell Express Self-Restoring Switchboards.
" " 16—Operator's Set and Accessories.
" " 17—Parts of Apparatus
" " 18—Magneto Telephones of all Kinds.

INDEPENDENT LOCAL AND LONG DISTANCE TELEPHONE

Bulletin No. 19—Central Energy Switchboards.
" " 20—Central Energy Telephones.
" " 21—Protective Apparatus and Terminal Equipment.
" " 22—Construction of Country Telephones Lines.
" " 23—Eight-Party Selective Ringing Telephones.
" " 24—Composite Telephone and Telegraph Lines.
" " 25—Four-Party "Leich" Selective Telephone System.
" " 26—Telephone Power and Ringing Equipment.

WE SEND THEM POSTPAID, WRITE FOR THEM

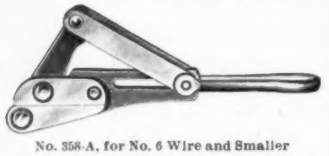
RUBBER COVERED WIRES AND CABLES

For all Classes of HIGH-GRADE ELECTRICAL SERVICE

42 Broadway, New York
N. I. R. Wires and Cables carried in stock by the MONARCH ELECTRIC & WIRE Co., Chicago, Ill.

NATIONAL INDIA RUBBER CO. BRISTOL, R. I.

Klein's New "Chicago Grip"



No. 358-A, for No. 6 Wire and Smaller

is made of steel forging, polished and nickel plated. It is a well-proportioned and reliable tool. The draw link is arranged so it does not fall in the way of the wire. It holds fast on iron or copper wire. Do not fail to have our Catalog on file. It is arranged with Code and List numbers for convenient ordering.

All prominent supply houses carry our products.

MATHIAS KLEIN & SONS
87 W. Van Buren Street :: CHICAGO, ILL.

SIMPLEX

FOR SUBURBAN
Underground Connections
USE
Steel Taped, Lead Covered Cables
No Conduit
Quickly Installed
Few Joints

INSULATED
WIRES and CABLES
RUBBER — CAMBRIC
THE SIMPLEX ELECTRICAL CO - BOSTON

Maintenance Costs Reduced

High-tension oscillations absorbed by the

Mansbridge Dreadnought Self-Sealing Condenser

It stands 5,000 volts permanently, 1,000 volts momentarily, and can be readily be made for higher voltages. Small, light and inexpensive.

PATENTED BY

G. F. MANSBRIDGE
St. Margarets, Sanderstead, Croyden England
But manufactured in the United States
New York Office:
Care of Louis Dejonge & Co., 71 Duane Street
Applications for license to manufacture should be addressed to the Patentee

THE SEYMOUR MFG. CO.

SEYMOUR, CONN.

GERMAN SILVER
RESISTANCE SHEET AND WIRE

COPPER WIRE
BRASS, BRONZE AND COPPER

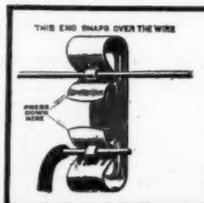
AMERICAN ELECTRICAL WORKS

OUR SPECIALTIES:
TELEPHONE WIRES AND CABLES

CHICAGO 135 Adams St. NEW YORK PHILLIPSDALE, R. I. 26 Cortlandt St.

OVER THREE MILLION

Have been used to fasten wires to brick walls
PEIRCE EXPANSION BOLTS
At All Jobbers PEIRCE SPECIALTY COMPANY, Elkhart, Ind.



Fahnestock "Snap-Over" Connector

For connecting bridging 'phones to party line wire. One end snaps over the tight line wire. No dead end needed. Connects iron wire, copper wire or iron to copper wire. Positive spring contact.

FAHNESTOCK ELECTRIC CO.
129 Patchen Ave. Brooklyn, N. Y.

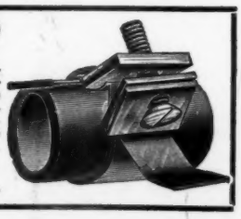
Magneto LOUD RINGING Extension
Telephone Bells

Size of gongs, 2½ in. to 10 in. All resistances. All weather-proof. Efficiency, durability and price will interest you.

Schwarze Electric Company
Main Office and Factory: Adrian, Michigan

M. & B. Ground Clamp
"THE CLAMP THAT CLAMPS"

For connecting telephone ground wires to lead or iron pipes. The tighter you set the screw the tighter it clamps. SIMPLE IN CONSTRUCTION, EASY TO ADJUST, FITS ANY SIZE PIPE. No lock nut connection to become loose. Wire soldered to strap. Remains tight whether pipe expands or contracts. No loose connections when our clamp is used.



Cheapest and Best Clamp on the Market
Write us for samples and prices
Milwaukee Electrical Specialties Co. - Milwaukee, Wis.